Programme Name:Pharmaceutics Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MPHARMPC/AllSem20.pdf

COURSE NAME: MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES COURSE CODE: MPT-1061

со	Description: After the completion of the course the students will be able
CO1	To know the various chemicals and reagents used in the analytical process.
CO2	To describe theoretical knowledge of various instruments
CO3	To apply the knowledge of instrumentation with skill and efficacy
CO4	To analyze the various single dosage form with various instruments
CO5	To evaluate the composition of combined dosage forms using different analytical techniques
CO6	To design a project for research and analysis

COURSE NAME: DRUG DELIVERY SYSTEM COURSE CODE: MPT-1062

СО	Description: After the completion of the course the students will be able
CO1	To study thedrug delivery system which helps in building a detailed concept of safe and effective transportation the specific active pharmaceutical ingredient to the target site of the body to achieve its desired therapeutic effect.
CO2	To understand the different approaches of development of technologies, transport system to design effective drug delivery in the human body.
CO3	To achieve detailed concept on various drug carriers, useful for safe, effective and target specific drug delivery system.
CO4	To acquire knowledge about latest drug delivery trends and will learn the theoretical basics to develop new formulation based on the personalized medication.

CO5	To expand the knowledge of recent advancements in parenteral delivery of protein and peptide and the approaches to design the drug delivery systems.
CO6	To explain the detailed concept of various vaccine delivery and different applications for clinical use.

COURSE NAME: MODERN PHARMACEUTICS COURSE CODE: MPT-1063

СО	Description: After the completion of the course the students will be able
CO1	To develop the idea of various pre-formulation concepts which basically helps in understanding the physicochemical properties of a new drug candidate that could affect the drug performance and the development of a dosage form.

CO2	To describe about new dosage forms by applying the principles of optimization technique by implementation of systemic approaches to search for the best combination of product and/or processes characteristics under a given set of conditions composition or experimental conditions.
CO3	To design validation protocol for solid and liquid dosage forms.
CO4	To apply the Current Good Manufacturing Practices and Industrial management principles in dosage form development to understand the concept of good total quality management of pharmaceutical production unit.
CO5	To describe the insight of the process of compaction and compression in solid dosage form development.
CO6	To develop an in-depth conceptual clarity of consolidation parameters.

COURSE NAME: PHARMACEUTICS PRACTICAL-1 COURSE CODE: MPT-1965

со	Description: After the completion of the course student will be able
CO1	To evaluate therapeutic agents by various instrumental analytical techniques
CO2	To perform preformulation studies for development of various dosage forms
CO3	To design and optimize various types of controlled oral, transdermal and mucosal drug delivery systems
CO4	To evaluate various developed drug delivery systems using suitable methods.
CO5	To predict pharmaceutical factors affecting drug release kinetics

COURSE NAME: MOLECULAR PHARMACEUTICS (NANO TECH AND TARGETEDDDS) (NANO

COURSE CODE: MPT-2081

со	Description: After the completion of the course the students will be able
CO1	To explain the different approaches for the development of novel drug delivery systems.
CO2	To describe the importance of site specific and target specific drug delivery system.
CO3	To be able to choose and use suitable polymers/excipients for safe, effective, target specific formulation design.
CO4	To gain theoretical knowledge of design and development of different delivery systems for a specific target of the drug.

CO5	To understand the basis of performing evaluation of the developed targeted drug delivery system.

CO6	To analyse and recommend the specific formulation approaches for site specific drug delivery.

COURSE NAME: ADVANCEDBIOPHARMACEUTICS & PHARMACOKINETICS COURSE CODE: MPT-2062

СО	Description: After the completion of the course the students will be able
CO1	To develop the concept of different pharmacokinetic parameters and factors affecting Administration, Distribution, Metabolism and Excretion processes.
CO2	To understand in-depth knowledge of bioavailability and bioequivalence studies and their quantitative measurements.
CO3	To demonstrate the science behind comparing and analysing the <i>in vitro</i> drug release profiles for different marketed products.

CO4	To describe the different pharmacokinetic and pharmacodynamic parameters affecting bioavailability and drug effect.
CO5	To grab the theoretical basis of the applications of biopharmaceutics and pharmacokinetics in the development of different types of biopharmaceuticals and pharmaceuticals products.
CO6	To solve the potential clinical pharmacokinetic problems and application of basics of pharmacokinetics.

COURSE NAME: COMPUTER AIDED DRUGDELIVERY SYSTEM COURSE CODE: MPT-2063

СО	Description: After the completion of the course the students will be able
CO1	To explain the History of Computers in Pharmaceutical Research and Development and Computational Modelling of Drug Disposition.

CO2	To describe the use of computers in preclinical and clinical development.
СОЗ	To optimize pharmaceutical formulation development techniques.
CO4	To demonstrate the use of computers in market analysis.
CO5	To explain the utility of Artificial Intelligence (AI) and Robotics in pharmaceuticals.
CO6	To gain in-depth knowledge in Computational fluid dynamics (CFD).

COURSE NAME: COSMETIC ANDCOSMECEUTICALS COURSE CODE: MPT-2064

CO	Description: After the completion of the course the students will be able
CO1	To understand the manufacturing of cosmeceuticals.

CO2	To design the quality and regulatory provisions for cosmeceuticals in India and for export of the same
CO3	To explain the biological aspects as well as the side effects related to cosmeceuticals.
CO4	To demonstrate the theory of building blocks of cosmetics, use of different preservatives, their merits, demerits.
CO5	To design the method of development of different cosmeceutical products.
CO6	To compile the applications of different herbal cosmetics, their uses, challenges in manufacturing and development.

COURSE NAME: PHARMACEUTICS PRACTICAL-II COURSE CODE: MPT-2985

со	Description: After the completion of the course student will be able
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CO1	To compare the dissolution efficiency of various marketed pharmaceutical products
CO2	To formulate and evaluate various cosmetic products
CO3	To design experiments based on QbD for optimization of drug delivery
CO4	To analyze and predict pharmacokinetic parameters using softwares
CO5	To evaluate computational modeling of drug disposition

COURSE NAME: PHARMACEUTICS PRACTICAL-II COURSE CODE: MPT-2985

СО	Description: After the completion of the course student will be able
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CO1	To compare the dissolution efficiency of various marketed pharmaceutical products
CO2	To formulate and evaluate various cosmetic products
СОЗ	To design experiments based on QbD for optimization of drug delivery
CO4	To analyze and predict pharmacokinetic parameters using softwares
CO5	To evaluate computational modeling of drug disposition

COURSE NAME: RESEARCH METHODOLOGY AND BIOSTATISTICS COURSE CODE: MPT-384

с о	Description: After the completion of the course the students will be able
CO 1	To understand the guidelines and requirements for preclinical research
CO 2	To apply the knowledge of biostatistics analyzing various data

CO 3	To design a project following the different components of research
CO 4	To interpret the guidelines and requirements for clinical research
CO 5	To employ the concept of good clinical practice and good laboratory practice in research
CO 6	To apply the knowledge of guidelines in clinical research and preclinical studies

Programme Name: Pharmacology

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MPHARMPCO/AllSem20.pdf

COURSE NAME: MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES COURSE CODE: MPT-1081

со	Description: After the completion of the course the students will be able
CO1	To know the various chemicals and reagents used in the analytical process.
CO2	To describe theoretical knowledge of various instruments
CO3	To apply the knowledge of instrumentation with skill and efficacy

CO4	To analyze the various single dosage form with various instruments
CO5	To evaluate the composition of combined dosage forms using different
	analytical techniques
CO6	To design a project for research and analysis

COURSE NAME: ADVANCED PHARMACOLOGY - I COURSE CODE: MPT-1082

со	Description: After the completion of the course the students will be able
CO1	To describe the pathophysiology of some diseases
CO2	To explain the pharmacokinetic and pharmacodynamic profile of various drugs
CO3	To describe the mechanism of drug action at the cellular and molecular level

CO4	To determine the adverse effects and contraindications of various drugs
CO5	To apply the knowledge in pharmacotherapy of certain diseases
CO6	To assess the activity of newer drugs of a particular disease

COURSE NAME: PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS - I

COURSE CODE: MPT-1083

со	Description: After the completion of the course the students will be able
CO1	To judge the value of the regulations and ethical requirements for the use of
	animals
CO2	To describe about the experimental animals used in the discovery of drugs.

СОЗ	To apply the knowledge of screening methods in pharmacology (invitro and
	invivo)
CO4	To apply the knowledge of good laboratory practices during experimentation on
	animals
CO5	To expand the preclinical data to human data in the drug discovery process
CO6	To evaluate the activity of new molecule for discovery

COURSE NAME: CELLULAR AND MOLECULAR PHARMACOLOGY - I COURSE CODE: MPT-1084

со	Description: After the completion of the course the students will be able

CO1	To explain the receptors that are involved with the major functions of the body
CO2	To explain the various signaling pathways in the transduction mechanism
CO3	To apply the knowledge of molecular pathways where the drugs act and the use
	of the biomarkers
CO4	To associate the knowledge of advanced molecular pharmacology in drug
	discovery
CO5	To design the advanced molecular techniques in drug discovery and
	pharmacotherapy
CO6	To evaluate the data of molecular methods for better drug discovery and pharmacotherapy

COURSE NAME: PHARMACOLOGY PRACTICAL-1 COURSE CODE: MPT-1985

со	Description: After the completion of the course student will be able
CO1	To apply the knowledge of pharmaceutical analysis and various methods of
	screening compounds
CO2	To identify the methods to be adopted while framing a project
CO3	To design a project for newer compounds
CO4	Increase the capability of interpreting data of the experimental results
CO5	To evaluate the results obtained from the research/project
CO6	To discover newer method of detecting the compounds

COURSE NAME: ADVANCED PHARMACOLOGY - II COURSE CODE: MPT-2081

СО	Description: After the completion of the course the students will be able
CO1	To describe the pathophysiology of some diseases
CO2	To explain the mechanism of action of drugs at the cellular and molecular level
CO3	To determine the adverse effects and contraindications of various drugs
CO4	To apply the knowledge in pharmacotherapy of certain diseases
CO5	To expand the knowledge in clinical pharmacology regarding certain diseases
	for different patients
CO6	To identify the various mechanism that are responsible for diseases

COURSE NAME: PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS-II

COURSE CODE: MPT-2082

СО	Description: After the completion of the course the students will be able
CO1	To explain the different toxicity studies
CO2	To identify the ethical and regulatory guidelines necessary for different toxicity
	studies
CO3	To demonstrate the knowledge of the toxicity studies in the drug discovery
CO4	To compare the various methods of toxicity study
CO5	To expand the practical knowledge of toxicity study in research and drug
	discovery process
CO6	To assess the toxic effects of various drugs

COURSE NAME: PRINCIPLES OF DRUG DISCOVERY COURSE CODE: MPT-2083

СО	Description: After the completion of the course the students will be able
CO1	To be able to understand and correlate the phases of Drug Discovery
CO2	To be able to understand the basis of finding Potential Targets of a disease and
	Validation of the same.
CO3	To be able to design models of the therapeutic target proteins.
CO4	To understand the computational method of finding Hits and thereby designing
	the lead molecule and it's optimization.
CO5	To understand the different types of protein-ligand interactions(Docking) and

	Thereby quantification and statistical representation of it.
CO6	To understand the basis of designing prodrug .

COURSE NAME: CLINICAL RESEARCH AND PHARMACOVIGILANCE COURSE CODE: MPT-2084

СО	Description: After the completion of the course the students will be able
CO1	To explain the various regulatory requirements needed for safety assessment
	study, clinical trials and pharmacovigilance
CO2	To understand the responsibilities of the personnel involved in clinical trials
CO3	To demonstrate different designs that can be used for safety assessment study,

	clinical trials, pharmacoepidemeology, pharmacoeconomics
CO4	To analyze the various adverse drug reactions
CO5	To compile the adverse drug reactions and communicate to the authorities and
	patient
CO6	To apply the knowledge in safetyassessment, clinical research,
	pharmacovigilance, pharmacoepidemeology, pharmacoeconomics

COURSE NAME: PHARMACOLOGY PRACTICAL-2 COURSE CODE: MPT-2985

CO1	To understand the various methods and guidelines required experimentation on
	animals
CO2	To apply the knowledge of various guidelines in toxicology and pharmacology
СОЗ	To interpret the data of the in vitro experimental results
CO4	To gain the ability to evaluate the results obtained from the research/project
CO5	To apply the newer experimental methods for findng the activity of the drugs.
CO6	To outline a project for newer compounds

COURSE NAME: RESEARCH METHODOLOGY AND BIOSTATISTICS COURSE CODE: MPT-384

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со	Description: After the completion of the course the students will be able

CO1	To understand the guidelines and requirements for preclinical research
CO2	To apply the knowledge of biostatistics analyzing various data
CO3	To design a project following the different components of research
CO4	To interpret the guidelines and requirements for clinical research
CO5	To employ the concept of good clinical practice and good laboratory practice in
	research
CO6	To apply the knowledge of guidelines in clinical research and preclinical studies

Programme Name : B.Tech in CSE Syllabus Link :http://makautexam.net/aicte_details/SyllabusI/CSE/AllSem20.pdf Course Title : Basic Electronics Engineering Course Code : ES-EE101

со	Description: After the completion of the course student will be able
CO1	To study the basics of semiconductor devices and their applications in different areas.
CO2	To study different biasing techniques to operate transistors, FET , MOSFET and operational amplifiers in different modes.
CO3	Analyze output indifferent operating modes of different Semiconductor devices.
CO4	Identify the type of electrical machine used for that particular application.
CO5	Realize the requirement of transformers in transmission and distribution of electric power and other applications
CO6	Formulate and solve complex AC, Dc circuits

СО	Description: After the completion of the course student will be able
CO1	Introduction to engineering design and its place in society
CO2	Exposure to the visual aspects of engineering design
CO3	Exposure to engineering graphics standards
CO4	Exposure to solid modelling

Course Code :BS-PH201 Physics-I

со	Description: After the completion of the course student will be able

CO1	Bragg's Law and introduction to the principles of lasers, types of lasers and applications.
CO2	Various terms related to properties of materials such as, permeability, polarization,etc
СОЗ	Some of the basic laws related to quantum mechanics as well as magnetic and dielectric properties of materials.
CO4	Simple quantum mechanics calculations.

Course Code : BS-M201 Mathematics – II

со	Description: After the completion of the course student will be able
CO1	Learn the ideas of probability and random variables, various discrete and continuous probability distributions with their properties and their applications in physical and engineering environment.

CO2	Understand the basic ideas of statistics with different characterisation of a univariate and bivariate data set.
СОЗ	Apply statistical tools for analysing data samples and drawing inference on a given data set.

Course Code: PCC-CS301 Principles of Programming Languages

со	Description: After the completion of the course student will be able
CO1	Knowledge of, and ability to use, language features used in current programming languages
CO2	An ability to program in different language paradigms and evaluate their relative benefits
CO3	An understanding of the key concepts in the implementation of common features of programming languages

PCC-CS302 Data Structure & Algorithms

СО	Description: After the completion of the course student will be able
CO1	Implement, analyze and determine the time and space complexity for a given problem of Array, Stack, Queue and Linked list.
CO2	Implement Tree and Graph and use them in solving a problem.
CO3	Write and implement an algorithm for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Linear Search, Binary Search and compare their performance in term of Space and Time complexity.
CO4	Identify appropriate data structure & algorithmic methods in problem solving.

Course: ES-CS 301 Digital Electronics

со	Description: After the completion of the course student will be able

CO1	Understand working of logic families and logic gates
CO2	Design and implement Combinational and Sequential logic circuits.
CO3	Understand the process of Analog to Digital conversion and Digital to Analog conversion.
CO4	Be able to use PLDs to implement the given logical problem.

Course: PCC-CS 391 Principles of Programming Language Lab

СО	Description: After the completion of the course student will be able
CO1	Write simple programs using an OO programming language such as C++/Python/Ruby

CO2	Write simple programs using a logic programming language such as Prolog/Lisp
CO3	Write simple programs using a functional programming language such Haskell/ML/SML/Scheme/Clojure

Computer Organization & Architecture Subject Code: PCC-CS402

СО	Description: After the completion of the course student will be able
CO1	Draw the functional block diagram of single bus architecture of a computer and describe the function of the instruction execution cycle, addressing modes, instruction set.
CO2	Given a CPU organization and instruction, design a memory module; analyze its operation by interfacing with the CPU and mapping techniques.
CO3	Write assembly language program for specified microprocessor, ability to explain the concept of control unit and I/O operations.
CO4	Given a CPU organization, apply design techniques to enhance performance using pipelining, and understand the concept of parallelism.

Course Name OPERATING SYSTEMS Course Code PCC-CS403

СО	Description: After the completion of the course student will be able
CO1	Create processes and threads and analyze the concepts of processes and threads in the operating system and illustrate the scheduling of processors for a given problem instance.
CO2	For a given specification of memory organization, develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
CO3	Identify and handle deadlock related issues.
CO4	Understand the implement file systems and directories along with the interfacing of IO devices with the operating system and disk management.

Course Name: OPERATING SYSTEMS LAB

Course Code: PCC-CS493

со	Description: After the completion of the course student will be able
CO1	Use a UNIX text editor to create a shell script and run scripts efficiently from the command line and write varying shell syntax.
CO2	Create process and handle the concepts of process, signal and semaphore in operating system.
CO3	Implement thread and thread synchronization, Inter-process communication

Design and Analysis of Algorithms

Course Code: PCC-CS404

со	Description: After the completion of the course student will be able
CO1	Analyze the worst-case running times of algorithms based on asymptotic analysis
CO2	Model a problem and develop the appropriate algorithm from divide and conquer, greedy, dynamic programming and other paradigms

CO3 Classify problems in appropriate complexit approximation and randomized algorithms computationally hard real life problems	y classes and apply in solving
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Computer Organization & Architecture Lab

Subject Code: PCC-CS492

СО	Description: After the completion of the course student will be able
CO1	Understand basic logic gates and efficiently verify the behavior of the circuit.
CO2	Acquire in-depth knowledge to implement different arithmetic operations.
CO3	Understand the working principle of the memory system.
CO4	Understand the working principle of CPU, and interfacing of CPU and Memory.

Design and Analysis of Algorithms Lab

Course Code: PCC-CS-494

СО	Description: After the completion of the course student will be able
CO1	Acquire efficiency in programming languages through implementation of different classes of algorithms
CO2	Acquire efficiency in using appropriate data structure for an algorithm to improve its overall efficiency
CO3	Acquire knowledge to decide a suitable algorithm for a new, computationally hard problem

Database Management Systems

Subject Code:PCC-CS502

со	Description: After the completion of the course student will be able
CO1	For a given problem (requirement specification) design the databases using E-R diagram method and convert it into Relational Database.
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CO2	For a given query write relational algebra and Relational Calculus expressions for that query and optimize the developed expressions.
CO3	For a given specification construct the SQL queries for Open source and Commercial DBMS.
CO4	For a given query optimize its execution using Query optimization algorithms.
CO5	Understand and implement transaction processing, concurrency control and Recovery system.
CO6	Understand different type of advanced database and know about database security.

Formal Language & Automata Theory

Subject Code: PCC-CS-503

со	Description: After the completion of the course student will be able
CO1	Write a formal notation for strings, languages and machines.
CO2	Design finite automata to accept a set of strings of a language.
CO3	For a given language determine whether the given language is regular or not.
CO4	Design context free grammars to generate strings of context free language.
CO5	Determine equivalence of languages accepted by Push Down Automata and languages generated by context free grammars
CO6	Write the hierarchy of formal languages, grammars and machines.
CO7	Distinguish between computability and non-computability and Decidability and undecidability

Course Code: PCC-CS504

Course Name: Object Oriented Programming

со	Description: After the completion of the course student will be able
CO1	Visualize a given problem scenario in terms of classes and objects.
CO2	Acquire the knowledge about different types of inheritance & polymorphism, interface, package, vector and wrapper class.
CO3	Apply object oriented programming concepts through Java for problem solving.
CO4	Acquire knowledge about threads, thread synchronization and applets and their life cycle.

Course Code: PCC-CS594

Course Name: Object Oriented Programming Lab

со	Description: After the completion of the course student will be able
CO1	Understand the object oriented approach of software development.
CO2	Learn about proper object oriented design principles while focussing on the reusability concept.
CO3	Implement a given design using Java.

Compiler Design

Course code: PCC-CS601

со	Description: After the completion of the course student will be able
CO1	For a given grammar specification develop the lexical analyser
CO2	For a given parser specification design top-down and bottom- up parsers
CO3	Develop syntax directed translation schemes
CO4	Develop algorithms to generate code for a target machine

Computer Networks

Course code: PCC-CS602

CO	Description: After the completion of the course student will be able
CO1	Explain the functions of the different layer of the OSI Model
CO2	Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.
CO3	For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component
CO4	Understand the functionality of each layer of TCP/IP protocol suite and developed the network programming for a given problem.
CO5	Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

Compiler Design LAB

Course Code: PCC-CS691

СО	Description: After the completion of the course student will be able
CO1	Use different available tools to implement compiler
CO2	Work in the development of compiler for a new computer language in the industry

Program Name: B.Tech in IT

Course Name: Physics-I

Code: BS-PH101

CO Description: After the completion of the will be able	course student
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CO1	Basic concepts of mechanics
CO2	Bragg's Law and introduction to the principles of lasers, types of lasers and applications
CO3	Various terms related to properties of materials such as, permeability, polarization, etc
CO4	Some of the basic laws related to quantum mechanics as well as magnetic and dielectric properties
CO5	Simple quantum and Statistical mechanics Calculation.

Course Name: Chemistry I

Code: BS-CH201

со	Description: After the completion of the course student will be able
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CO1	Analyze microscopic chemistry in terms of molecular orbital's and intermolecular forces
CO2	Rationalize bulk properties and processes using thermodynamic considerations
CO3	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
CO4	Rationalize periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
CO5	List of the chemical reactions that are used in the synthesis of molecules.

Mathematics-IA

Code: BS-M101

со	Description: After the completion of the course student will be able
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CO1	Analyze microscopic chemistry in terms of molecular orbital's and intermolecular forces
CO2	Rationalize bulk properties and processes using thermodynamic considerations
CO3	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques

Physics-I Laboratory Code: BS-PH191/ BS-PH291

СО	Description: After the completion of the course student will be able
CO1	Apply the various techniques and procedures for the Engineering Physics experiments
CO2	Use the different meters and measuring devices to record the data with precision

CO3	Apply the equations/mathematical concepts to obtain quantitative results
CO4	Develop basic communication skills through working in groups in performing the laboratory experiments.
CO5	Acquire skill for interpreting the results obtained from Laboratory experiments.

Chemistry-I Laboratory Code: BS-CH191/ BS-CH291

со	Description: After the completion of the course student will be able
CO1	Analyze the requirement of equipment to be used for a particular experiment.
CO2	Perform the titration experiments of acid & base using indicator using pH meter & conductivity meter.

СОЗ	Determination of hardness, dissolved oxygen & chloride ion in water.
CO4	Able to analyze a chemical salt, oil and check impurity.
CO5	Able to handle instruments

Mathematics – II A Code: BS-M201

со	Description: After the completion of the course student will be able
CO1	Familiar with the concept and techniques of probability and statistical theory
CO2	Understand the domain of applications of probability and statistical theory to engineering problems.
CO3	Learn different types of data analytic and data analysis methods through statistical theory.
CO4	Apply statistical tools for analyzing data samples and drawing inference on a given data set.

CO5	Learn and apply several decision making method from large sample of data or such problem

English Code: HU-MU201

со	Description: After the completion of the course student will be able
CO1	At the end of the course, students should be able to recall the basic tenets of English grammar, using them in formation of sentences for speaking and writing skills.
CO2	The students should be able to compare the skill sets to be used for given situations.
CO3	The students should be able to utilize the concepts which they have garnered in the assessments as well as in practical situations.
CO4	The students should be able to test the skills which they have learnt such as the concepts of notetaking via lesson on Minutes of Meeting to real-life situations.
CO5	The students should be able to prioritize certain facets of their knowledge in accordance to individual application.

CO6	The students can modify their narratives/discourse in accordance to their requirement and individuality
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Language Laboratory Code: HU-MU291

со	Description: After the completion of the course student will be able
CO1	Recall the basic tenets of English conversation.
CO2	Relate the skill sets to be used for given situations.
CO3	Make use of the skill of listening in acquiring new knowledge
CO4	Examine the skills which they have learnt in real-life situations.
CO5	Defend their statements properly using concise logic.

Data Structure & Algorithm Code: PCC-IT301

со	Description: After the completion of the course student will be able
CO1	Summarize the concept of data structure, data type and array data structure.
CO2	Implement linked list data structure to solve various problems.
CO3	Apply various data structures such as stacks, queues, trees and graphs to solve various computing problems using C- programming language.
CO4	Compare the standard algorithms for searching and sorting.
CO5	Evaluate the performance of an algorithm in terms of complexity using asymptotic notation.
CO6	Choose effectively the data structure that efficiently model the information in a problem.

Data Structure & Algorithm Lab Code: PCC-IT391

СО	Description: After the completion of the course student will be able
CO1	Represent data for efficient processing using the fundamental concept of Data Structure
CO2	Develop applications using the search algorithms and sorting algorithms based on their time complexities.
CO3	Develop applications using the concepts of linear data structure like stack, queue and Linked List for different requirements
CO4	Implement non-linear data structure like trees and graphs.
CO5	Design the application using the data structure that efficiently model the information in a problem

IT Workshop (Sci Lab/MATLAB/Python/R) Code: PCC-IT392

со	Description: After the completion of the course student will be able
CO1	Understanding the contributions of scripting languages.
CO2	Design real life problems and think creatively about solutions
CO3	Apply a solution in a program using R/Matlab/Python
CO4	Solve real life problems using advanced applications of mathematics, engineering, natural sciences

Mathematics-III (Differential Calculus) Code: BSC-301

со	Description: After the completion of the course student will be able
CO1	Distinguish between absolute and conditional convergence of series and be aware of the consequences of reordering terms in conditionally converging series.

CO2	Apply partial derivatives for estimating maxima and minima of real-life multivariable functions
CO3	Make use of double and triple integrals to find the volume of rectangular regions in the xyz-plane
CO4	Understand the terms 'exponential growth/decay', 'proportionate growth rate' and 'doubling/halving time' in differential equation when applied to population models, and the terms 'exponential decay', 'decay constant' and 'half-life' in D.E when applied to radioactivity.
CO5	Analyze new networks using the main concepts of graph theory

Biology Code: BSC 302

СО	Description: After the completion of the course student will be able
CO1	Describe biological observations of the 18th century that lead to major discoveries.

CO2	Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical, and ecological.
CO3	Highlight the concepts of excessiveness and dominance during the passage of genetic material. Also identify DNA as a genetic material in the molecular basis of information transfer.
CO4	Convey all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine.
CO5	Classify enzymes and distinguish between the different mechanisms of enzyme action
CO6	Identify and classify microorganisms.
CO7	Apply thermodynamic principles to biological systems.

Discrete Mathematics Code: PCC-IT401

со	Description: After the completion of the course student will be able

CO1	Express a logic sentence in terms of predicates, quantifiers and logical connectives
CO2	Derive the solution for a given problem using deductive logic and prove the solution based on logical inference
CO3	Classify its algebraic structure for a given mathematical problem
CO4	Evaluate Boolean functions and simplify expressions using the properties of Boolean Algebra.
CO5	Develop the given problem as graph networks and solve with techniques of graph theory.

Computer Organization & Architecture Code: PCC-IT402

СО	Description: After the completion of the course student will be able
CO1	To learn the Concept of a Computer System and Design methodology of Processor Design

CO2	To learn Data path Design (Design of Adder, Subtractor, multiplier etc. and advanced ALU)
CO3	To learn the design of hardwired control unit, micro programmed and nano-programmed Control unit
CO4	To learn the concept of RISC & CISC processors, Harvard Architecture.
CO5	To learn Memory Technology & design various types of memory units and memory Organization
CO6	To learn the concept of Performance Enhancement of Processor by Pipelining
C07	FPG Architecture, design and concept of Reconfigurable Architecture

Computer Organization & Architecture Lab Code: PCC-IT492

со	Description: After the completion of the course student will be able
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CO1	To learn the Concept of a Computer System and Design methodology of Processor Design
CO2	To learn Datapath Design (Design of Adder, Subtractor, multiplier etc. and advanced ALU)
CO3	To learn the design of hardwired control unit, micro programmed and nano-programmed Control unit.
CO4	To learn the concept of RISC & CISC processors, Harvard Architecture.
CO5	To learn Memory Technology & design various types of memory units and memory Organization
CO6	To learn the concept of Performance Enhancement of Processor by Pipelining
CO7	FPG Architecture, design and concept of Reconfigurable Architecture

Formal Language & Automata Theory Code: PCC-IT403

СО	Description: After the completion of the course student will be able
CO1	Define the mathematical principles behind theoretical computer science.
CO2	Illustrate for the different types of automata like finite automata, push down automata, linear bounded automata and Turing machine.
CO3	Correlate the different types of automata to real world applications
CO4	Design appropriate automata for the different requirements outlined by theoretical computer science.
CO5	Identify the different computational problems and their associated complexity.

Communication Engineering Code: PCC-IT404

СО	Description: After the completion of the course student will be able

CO1	To understand the fundamentals of radio communication system and analog modulation and demodulation techniques applying the basic knowledge of signals and systems and will be able to understand the concept of Frequency modulation
CO2	To apply the basic knowledge of electronic circuits and understands the effect of Noise in communication system and noise performance of AM & FM systems
СОЗ	To understand TDM and Pulse Modulation techniques and baseband transmission schemes
CO4	To apply the knowledge of statistical theory of communication and signals and system and to explain and evaluate the performance of digital communication system in the presence of noise
CO5	To describe and analyze the digital communication system with spread spectrum modulation.
CO6	To design as well as conduct experiments, analyze and interpret the results to provide valid conclusions for analog & digital modulators and demodulators using hardware components and communication systems using CAD tool.

Communication Engineering Lab Code: PCC-IT494

со	Description: After the completion of the course student will be able
CO1	Understand the generation of AM signals and its performance
CO2	Study the amplitude demodulation techniques
CO3	Understand the generation of FM signals and its performance
CO4	Study the frequency demodulation techniques
CO5	Perform signal sampling by determining the sampling rates for baseband signals & to generate digital modulation signals for PAM
CO6	Understand the generation of PWM & PPM schemes and estimate their output performance

Economics for Engineers (Humanities-II) Code: HSMC-401

со	Description: After the completion of the course student
	will be able

CO1	Knowledge of Basic and its Global Application.
CO2	Grasping the perceptions of all basic economic concepts
CO3	Applications of Concepts of Economics in various fields of Studies.
CO4	Understanding the concepts and its applications in Micro Economics.
CO5	Economical advances and its applications.
CO6	Advanced applications and future trending in Economics.

Environmental Sciences Code: MC-401

со	Description: After the completion of the course student will be able
CO1	describe the natural environment and its relationships with human activities

CO2	learn fundamental Knowledge of science and engineering to assess environmental and health risk
CO3	develop guidelines and procedures for health and safety issues obeying environmental laws and regulations
CO4	acquire skills for scientific problem-solving related to air, water, noise & land pollution
CO5	gain knowledge how to perform EIA, Environmental Audit to assess the impact and further development

Design Analysis & Algorithms Code: PCC-IT501

со	Description: After the completion of the course student will be able
CO1	Define the Significance of Algorithm, its applications and how to formulate and solve complex engineering problems related to Computer Science and Engineering
CO2	Explain the mathematical expressions to prove asymptotic bounds for time complexity and use asymptotic notation to

	formulate the time and space requirements of complex problems.
CO3	Choose the fundamental techniques to design the algorithms efficiently. Understanding of basic recursive problems, finding recurrence relations and solved sorting problems (quick sort and merge sort) by divide and conquer approach
CO4	Analyze the time complexity of different algorithms and Define dynamic programming approach and build solution for the optimization problems like chain matrix multiplication, all pair shortest path etc. Analyze the concept of greedy technique and apply it to solve the problems like single pair shortest p
CO5	Explain the back tracking methodology and develop 8 Queens problem and graph coloring problem using it, also develop branch- and-bound algorithms

Design Analysis & Algorithm Lab Code: PCC-IT591

СО	Description: After the completion of the course student will be able
CO1	Solve some problems using recursion

CO2	Develop searching algorithms and sorting algorithms
CO3	Represent Tree & Graphs and solve Bin Packing & TSP
CO4	Implement KMP, BFS and DFS algorithms
CO5	Estimate the minimum cost of spanning tree, minimum cost any two nodes of a graphs, etc

Database Management System (DBMS) Code: PCC-IT502

со	Description: After the completion of the course student will be able
CO1	Illustrate the different components of database and data model
CO2	Design the databases using E R method and normalization for a given specification of the requirement
CO3	Construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2

CO4	Optimize query execution using Query optimization algorithms
CO5	Determine the transaction atomicity, consistency, isolation, and durability for a given transactionprocessing system
CO6	Justify the ACID property based on locking, time stamping algorithm on concurrency control and Serializability of scheduling.

Database Management System Lab Code: PCC-IT592

СО	Description: After the completion of the course student will be able
CO1	Illustrate different types of SQL commands
CO2	Formulate queries using SQL operators
CO3	Apply different types of joining operation on multiple tables

CO4	Implement various queries using different functions and elaborate nested queries
CO5	Construct Views
CO6	Describe the concept of cursor and triggers

Operating Systems (OS) Code: PCC-IT503

СО	Description: After the completion of the course student will be able
CO1	Explain the structure of different operating systems and different functionalities of it
CO2	Identify process, thread, the communication between application programs and hardware devices through system calls.
CO3	Analyze and CPU scheduling algorithm. Inspect process synchronization and its consequences

CO4	Inspect process synchronization and deadlock.
CO5	Apply different memory management scheme
CO6	Analyze different file systems, I/O devices, disk scheduling and different security vulnerabilities

Operating System Lab Code: PCC-IT593

со	Description: After the completion of the course student will be able
CO1	Understand the fundamental concept of shell script.
CO2	Apply the concept of Array in shell script
CO3	Apply the concepts of string in shell script
CO4	Apply the concepts of loop in shell script
CO5	Apply the concepts of string in shell script

Object Oriented Programming withPython Code: PCC-IT504

СО	Description: After the completion of the course student will be able
CO1	Analyze the drawbacks of Procedure Oriented Programming comparing with the concepts of Object Oriented Programming paradigm
CO2	Identify the role of Classes & Objects, constructors & destructors in program design.
CO3	Design various forms of inheritance and class constructors are called.
CO4	Evaluate operator overloading, runtime polymorphism Programming through examples
CO5	Explore exception handling and various Stream classes, I/O operations in handling file operations.

Object Oriented Programming with Python Lab Code: PCC-IT594

со	Description: After the completion of the course student will be able
CO1	Develop algorithmic solutions to simple computational problems.
CO2	Demonstrate programs using simple Python statements and expressions
CO3	Evaluate operator overloading, runtime polymorphism Programming through examples
CO4	Design various forms of inheritance and analyze how base class constructors are called.
CO5	Explain files, exception, modules and packages in Python for solving problems.

Introduction to Industrial Management (Humanities III) Code: HSMC-501

СО	Description: After the completion of the course student will be able
CO1	Understand the Genesis of Industrial Engineering and Management (IEM).
CO2	Understand the linkage between IEM and Operations Management (OM)
CO3	Understand applications of OM
CO4	Applications of Optimization Principles
CO5	Applications of Principles of IEM in Industry.
CO6	Justification and controlling of improvements and applications in industry.

Software Engineering Code: PCC-IT601

со	Description: After the completion of the course student will be able
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CO1	Identify software Engineering problem specification, performance, maintenance and quality requirements
CO2	Select modern engineering tools necessary for software project management, time management and software reuse
CO3	Analyze, elicit and specify software requirements through a productive working relationship with various stakeholders of the project.
CO4	Distinguish different testing strategies and it's working.
CO5	Design applicable solutions in one or more application domains using software engineering approaches that integrates ethical, social, legal and economic concerns.
CO6	Develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice

Software Engineering Lab Code: PCC-IT691
СО	Description: After the completion of the course student will be able
CO1	To handle software development models through rational method
CO2	To prepare SRS document, design document, test cases and software configuration management and risk management related document
CO3	To Develop function oriented and object oriented software design using tools like rational rose
CO4	To perform unit testing and integration testing.
CO5	To apply various white box and black box testing techniques.
CO6	Able to Plan a software engineering process life cycle.

Computer Networks Code: PCC-IT602

СО	Description: After the completion of the course student will be able
CO1	Explain the basics of computer networking, different network model and architecture
CO2	Analyze different networking functions and features for identifying optimal solutions
CO3	Apply different networking concepts for implementing network solution
CO4	Evaluate and implement routing algorithms for implanting solution for the real life problems
CO5	Develop implement model of fault tolerant computer networks

Computer Networking Lab Code: PEC-IT692

со	Description: After the completion of the course student
	will be able

CO1	Understanding of network simulation tool
CO2	Ability to understanding the networking device, network command and configuration
CO3	Ability to simulate network topology using packet tracer software
CO4	The ability to do socket programming

Internet & Web Technology Code: PCC-IT701

СО	Description: After the completion of the course student will be able
CO1	Define the principal of Internetworking, TCP/IP protocols, World Wide Web, client-server architecture, IP addressing, routing etc.
CO2	Explain the need for secured web application development with client-side, server-side scripting languages

СОЗ	Construct web programs using the web languagesHTML, XML, JavaScript, Applet, Perl, etc.
CO4	Design and Develop small interactive websites using modern tools following the professional web based engineering solutions, ethics and management techniques.
CO5	Explain the advanced technologies like network security, multimedia applications, search engine, web crawler, etc with the websites

Internet & Web Technology Lab Code: PCC-IT791

СО	Description: After the completion of the course student will be able
CO1	Explain internet development techniques and Protocols leading Web.
CO2	Understand the different approaches in network security model.
CO3	Design different web pages using HTML, XML, CSS, JavaScript, and Java applet

CO4	Create client-server model using socket programming techniques
CO5	Develop interactive internet/web applications based on Servlets and JSP

Management 1 (Organizational Behavior) Code: HSMC-IT701

СО	Description: After the completion of the course student will be able
CO1	Describe organizational behavior and differentiate between the three levels of influence
CO2	Discuss the impact that diversity of race, gender, ability, religion, and age has on the workplace
CO3	Recognize the importance of recognizing and valuing individuals' differences
CO4	Explain the importance of managing stress and emotions in the workplace

CO5	Identify common organizational structures and the advantages and disadvantages of each

Information Security Code: PCC-IT801

со	Description: After the completion of the course student will be able
CO1	Examine and apply the fundamental techniques of computer security.
CO2	Identify and explain risk and potential security issues
CO3	Demonstrate responsible computer use as it deals with social, political, legal and ethical issues in today's electronic society
CO4	Demonstrate knowledge of the profession, its organizations, goals and leadership roles, Literature/publications, issues, and research foundations
CO5	Demonstrate knowledge of security objectives and policy development

CO6	Plan for the future and design a solution based on user requirements. Explain business continuity, backup and disaster recovery. Understand troubleshooting and quality consumer support

Program Name: BBA in Business Analytics

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBABA/sem120.pdf

Paper Name: Principles of Management Paper Code: BBA(BA) - 101

со	Description: After the completion of the course student will be able
CO1	make use of the process, functions, principles of management in business scenario
CO2	utilize effective communication for operating the organization
CO3	apply the leadership ability to manage the workforce in organization
CO4	categorize various management issues to structure the organization for effective controlling in organization

CO5	examine the factors that foster organizational change

Paper Name: Business Economics Paper Code: BBA(BA) – 102

со	Description: After the completion of the course student will be able
CO1	classify the basic problems of an economy
CO2	develop an understanding about the market structure including pricing, labour, capital etc.
CO3	Make use of macro-economic related concepts to arrive at business decisions
CO4	interpret public finance, international trade and finance

Paper Name: Business Communication Paper Code: BBA(BA) – 104

СО	Description: After the completion of the course student will be able
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CO1	identify the basic concepts of the usage of English grammar & vocabulary incommunication.
CO2	interpret facts and ideas by organizing, comparing, translating, interpreting, givingdescriptions, and stating the main ideas given in written texts.
СОЗ	apply acquired linguistic knowledge in producing various types of written texts
CO4	analyze facts and ideas from aural inputs

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBABA/sem220.pdf

Paper Name: Inferential Statistics and Applications Paper Code: BBA (BA) – 201

со	Description: After the completion of the course student will be able
CO1	Inspect the key terminologies, concepts tools and techniques used in business statistical analysis.
CO2	Apply the data frequency & distribution and measures of central tendency and measures of dispersion for solving business problems.

CO3	Develop the ability to perform statistical calculations using computer based statistical software.
CO4	Make use of the basic data analysis-and hypothesis testing procedures

Paper Name: Inferential Statistics and Applications Paper Code: BBA (BA) – 291

со	Description: After the completion of the course student will be able
CO1	examine data types, expressions, statements of an open source software required for inferential statistics and its applications
CO2	make use of various packages of an open source software required for inferential statisticsand its applications
CO3	apply the data frequency & distribution and measures of central tendency and measures of dispersion for solving business problems using an open source software.
CO4	apply an open source software language for carrying out basic data analysis-and hypothesis testingprocedures

Paper Name: Organizational Behaviour Paper Code: BBA (BA) – 202

СО	Description: After the completion of the course student will be able
CO1	demonstrate the applicability of the concept of organizational behavior to understand thebehavior of people in the organization.
CO2	illustrate the applicability of analyzing the complexities associated with management ofindividual behavior in the organization.
CO3	relate with how the organizational behavior can align with the diverse culture of employeesin MNCs.
CO4	identify the role of communication in an organization

Paper Name: Environment & Sustainable Development. Paper Code: BBA (BA) 204

со	Description: After the completion of the course student will be able

CO1	explain the knowledge base on ecosystem and types of environmental pollutions.
CO2	relate with the efforts that can be made at the Industry and Government level to improvethe environment, the economy and the quality of life
CO3	build basic understanding on sustainable development with a vision to balance oureconomic, environmental and social needs, allowing opulence for now and future generations
CO4	illustrate the environmental issues and challenges

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBABA/sem320.pdf

Paper Name: Business Research Methods Paper Code: BBA (BA) 301

СО	Description: After the completion of the course student will be able
CO1	explain the basic nature and purpose of Research and its advantages to business.
CO2	make use of different research designs, data collection process, tools, data cleaning and analysis techniques.

CO3	Develop skills to write business research report.
CO4	apply the understanding of various statistical tools and its application for data analysis and interpretation

Business Research Methods-Practical Code: BBA (BA) 391

со	Description: After the completion of the course student will be able
CO1	make use of various classification and data presentation techniques on data sets.
CO2	apply central tendency and variance to check the nature of a data set
CO3	inspect data types and control structures of an open-source programming language
CO4	make use of an open-source programming language to get a basic understanding of hypothesis testing

Paper Name: Financial Accounting and Management Paper Code: BBA (BA) 302

со	Description: After the completion of the course student will be able
CO1	demonstrate the conceptual knowledge of financial accounting
CO2	transfer the skills for recording various kinds of business transactions from the very basics to a level of sole proprietorship business, partnership business to the level of company accounts.
CO3	create provision for depreciation and reserves and bank reconciliation for rectifying the errors
CO4	examine different statements of accounts to evaluate the firm's financial health.

Paper Name: Marketing Management & Metrics Paper Code: BBA (BA) 303

со	Description: After the completion of the course student will be able
CO1	develop understanding on fundamentals of marketing concepts, theories, and principles in areas of marketing.

CO2	explain the role of consumer in the marketing program
CO3	apply the basic strategies of marketing in the organization
CO4	design the effective marketing programs

Paper Name: Personality Development Paper Code: BBA (BA) – 305

со	Description: After the completion of the course student will be able
CO1	outline different components of personality of human being
CO2	identify the various factors involved in self-assessment for professional development
CO3	apply business and professional etiquette in real life
CO4	make use of concepts, theories, or issues in human development which will help become industry-ready.

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBABA/sem420.pdf

Paper Name: Predictive Analytics Paper Code: BBA (BA) 401

СО	Description: After the completion of the course student will be able
CO1	Apply specific statistical and predictive analysis methods applicable to real life scenario.
CO2	Evaluate the appropriateness and validity of models and able to interpret and report the results for a management audience.
CO3	Apply Univariate, Bivariate and Multivariate predictive analytical techniques to solve problems.
CO4	Evaluate the effectiveness of various classification problems to gain effective real life and business-related solutions.

Paper Name: Supply Chain Management Paper Code: BBA(BA) 402

со	Description: After the completion of the course student will be able

CO1	examine the fundamentals of elements and functions of logistics, supply chain, role of drivers and demand forecasting.
CO2	assess the various frameworks of the supply chain management.
СОЗ	analyze the importance of logistics in the formulation of the business strategy and the conduct of supply chain operations
CO4	apply the basics of Supply Chain Analytics and its application in Supply Chain Management.

Paper Name: Customer Relationship Management Paper Code: BBA(BA) 403

СО	Description: After the completion of the course student will be able
CO1	demonstrate the concepts, terms, benefits of CRM, how CRM creates value for organizations and customers.
CO2	examine tools and techniques useful in implementing customer relationship management along with how to evaluate the successfulness.

CO3	interpret CRM Metrics to manage better customer relationship
CO4	develop customer related database for CRM

Paper Name: Data Analysis using R Paper Code: BBA BA) 405

со	Description: After the completion of the course student will be able
CO1	identify variables, syntaxes, operations, and conditional statements.
CO2	illustrate the data types & data structures, subletting in R, data import, export, control Structures & user defined functions
CO3	apply appropriate R packages to solve problems.
CO4	make use of statistical analysis and data mining techniques to solve business problems

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBABA/sem520.pdf

Paper Name: Business Ethics and Corporate Social Responsibility Paper Code: BBA (BA) - 501

со	Description: After the completion of the course student will be able
CO1	define students to learn the common ethical issues in business.
CO2	analyze how business people make ethical decisions and handle ethical issues.
CO3	illustrate specific measures of companies for building effective ethical programs
CO4	analyze the impact of CSR implementation on corporate culture, particularly as it relates to social issues

Paper Name: Entrepreneurship Paper Code: BBA (BA) 502

СО	Description: After the completion of the course student will be able
CO1	interpret the concepts of entrepreneurship and the role of an entrepreneur in the economic development

CO2	list various steps as well as aspects involved in entrepreneurship in India
CO3	classify the scope and policies in women entrepreneurship.
CO4	apply various tools and techniques in solving real life problem in developing entrepreneurship.

Paper Name: Project Management Paper Code: BBA (BA) 601

со	Description: After the completion of the course student will be able
CO1	explain the concepts of Project Management from planning to execution of projects
CO2	interpret various steps as well as aspects involved in Project Management.
CO3	identify the importance of team in the successful execution of a project
CO4	compile the tools and techniques of project management along with application in proper context.

Paper name: Data Structures and Algorithms Paper Code: BBA (BA) – 602

со	Description: After the completion of the course student will be able
CO1	Apply the concept of data types, algorithms in business related contexts.
CO2	Make use of basic data structures such as arrays, linked lists, stacks and queues.
CO3	Apply graphs, trees to develop algorithms for solving business related problems.
CO4	Make use of sorting, searching algorithms in business related contexts.

Program Name: BBA

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBA/sem120.pdf

Paper Code: BBA - 101 Principles of Management

со	Description: After the completion of the course student
	will be able

CO1	make use of the process, functions, principles of management in business scenario
CO2	utilize effective communication for operating the organization
CO3	apply the leadership ability to manage the workforce in organization
CO4	categorize various management issues to structure the organization for effective controlling of organization
CO5	examine the factors that foster organizational change

Paper Code: BBA - 102 Business Economics

со	Description: After the completion of the course student will be able
CO1	classify the basic problems of an economy
CO2	develop an understanding about the market structure including pricing, labour, capital etc.

CO3	make use of macro-economic related concepts to arrive at business decisions
CO4	interpret public finance, international trade and finance

Course Name: Business Communication Course Code: BBA 104

СО	Description: After the completion of the course student will be able
CO1	identify the basic concepts of the usage of English grammar & vocabulary in communication.
CO2	interpret facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating the main ideas given in written texts.
CO3	apply acquired linguistic knowledge in producing various types of written texts
CO4	analyze facts and ideas from aural inputs

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBA/sem220.pdf

Operations Management Paper Code: BBA - 201

со	Description: After the completion of the course student will be able
CO1	identify the elements of operations management and various transformation processes to enhance productivity and competitiveness
CO2	analyze and evaluate various manufacturing systems, location and layout concepts.
CO3	develop a balanced line of production & scheduling and sequencing techniques in operation environments.
CO4	apply the concept of Maintenance management and purchase management

Organizational Behaviour Paper Code: BBA - 202

со	Description: After the completion of the course student will be able
CO1	demonstrate the applicability of the concept of organizational behavior to understand the behavior of people in the organization

CO2	illustrate the applicability of analyzing the complexities associated with management of individual behavior in the organization.
СОЗ	relate with how the organizational behavior can align with the diverse culture of employees in MNCs
CO4	identify the role of communication in an organization

Paper Code: BBA - 204 Environment & Sustainable Development

СО	Description: After the completion of the course student will be able
CO1	explain the knowledge base on ecosystem and types of environmental pollutions.
CO2	relate with the efforts that can be made at the industry and government level to improve the environment, the economy and the quality of life.
CO3	build basic understanding on sustainable development with a vision to balance our economic, environmental and social needs, allowing opulence for now and future generations.

CO4	illustrate the environmental issues and challenges
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Business Research Methods Paper Code: BBA - 301

со	Description: After the completion of the course student will be able
CO1	explain the basic nature and purpose of research and its advantages to business
CO2	make use of different research designs, data collection process, tools, data cleaning andanalysis techniques.
CO3	develop skills to write business research reports.
CO4	apply the understanding of various statistical tools and its application for data analysis and interpretation.

Course: Business Research Methods-Practical Code: BBA 391

со	Description: After the completion of the course student will be able

CO1	make use of various classification and data presentation techniques on data sets.
CO2	apply central tendency and variance to check the nature of a data set
CO3	inspect data types and control structures of an open-source programming language
CO4	make use of an open-source programming language to get a basic understanding ofhypothesis testing

Financial Accounting Paper Code: BBA - 302

со	Description: After the completion of the course student will be able
CO1	demonstrate the conceptual knowledge of financial accounting

CO2	transfer the skills for recording various kinds of business transactions from the very basics to a level of sole proprietorship business, partnership business to the level of company accounts.
CO3	create provision for depreciation and reserves and bank reconciliation for rectifying the errors
CO4	examine different statements of accounts to evaluate the firm's financial health.

Paper Name-Marketing Management Paper Code: BBA - 303

со	Description: After the completion of the course student will be able
CO1	develop understanding on fundamentals of marketing concepts, theories, and principles inareas of marketing.
CO2	explain the role of consumer in the marketing program
CO3	apply the basic strategies of marketing in the organization
CO4	design the effective marketing programs.

Paper Name-Personality Development Paper Code: BBA - 305

со	Description: After the completion of the course student will be able
CO1	outline different components of personality of human being
CO2	identify the various factors involved in self-assessment for professional development
CO3	apply business and professional etiquettes in real life
CO4	make use of concepts, theories or issues in human development which will helpbecome industry-ready.

Syllabus link: http://makautexam.net/aicte_details/SyllabusI/BBA/sem420.pdf

Human Resource Management Paper Code: BBA - 401

со	Description: After the completion of the course student will be able

CO1	develop the understanding of the concept of HR management in the organizations.
CO2	demonstrate necessary skill set for application of various HR issues.
CO3	apply HR concepts to take correct business decisions.
CO4	analyse the strategic issues and strategies required to select and develop human resources.

Sales & Distribution Management Paper Code: BBA - 402

со	Description: After the completion of the course student will be able
CO1	describe the roles and responsibilities of sales function
CO2	analyze the distribution channel's efficiency and effectiveness.
CO3	relate with the concepts that can improve the sales force productivity and performance.

CO4	develop an effective sales strategy for their organizations.

Customer Relationship Management Paper Code: BBA - 403

со	Description: After the completion of the course student will be able
CO1	demonstrate the concepts, terms, benefits of CRM, how CRM creates value for organizations and customers.
CO2	examine tools and techniques useful in implementing customer relationship management along with how to evaluate the successfulness.
CO3	interpret CRM Metrics to manage better customer relationship
CO4	develop customer related database for CRM

Paper Code: BBA- 405 Computer Applications

со	Description: After the completion of the course student will be able
CO1	identify the employability skills and a commitment to professionalism by learning basic and important computer applications.
CO2	illustrate a variety of advanced spread sheet, operating system and word processing functions.
CO3	examine a range of problems using office productivity applications and adapt to new software releases
CO4	design quality assurance program through critically evaluating procedures and results by applying office productivity applications.

Paper Name: Financial Management and Risk Analysis Paper Code: BBA 501

со	Description: After the completion of the course student will be able
CO1	examine the conceptual framework on Finance Functions and objectives

CO2	develop corporate final accounts and cash flow statements in the business growth model
CO3	analyse financing and investment decisions considering discounting and nondiscounting factors
CO4	examine the importance of working capital management and risk capital management.

Paper Name: Entrepreneurship Paper Code: BBA-502

со	Description: After the completion of the course student will be able
CO1	interpret the concepts of entrepreneurship and the role of an entrepreneur in the economic development
CO2	list various steps as well as aspects involved in entrepreneurship in India
CO3	classify the scope and policies in women entrepreneurship.

CO4	apply various tools and techniques in solving real life problem in developing entrepreneurship
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Link: http://makautexam.net/aicte_details/SyllabusI/BBA/sem620.pdf

Paper name: Project Management Paper Code: BBA 601

со	Description: After the completion of the course student will be able
CO1	explain the concepts of Project Management from planning to execution of projects
CO2	interpret various steps as well as aspects involved in Project Management
CO3	identify the importance of team in the successful execution of a project
CO4	compile the tools and techniques of project management along with application in proper context

Paper Name: Supply Chain and Logistics Management Paper Code: BBA- 602

со	Description: After the completion of the course student will be able
CO1	examine the fundamentals of elements and functions of logistics, supply chain, role of drivers and demand forecasting.
CO2	assess the various frameworks of the supply chain management.
CO3	analyze the importance of logistics in the formulation of the business strategy and the conduct of supply chain operations.
CO4	apply the basics of Supply Chain Analytics and it's application in Supply Chain Management

Program Name: BBA in Hospital Management

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBAHM/sem120.pdf

Paper: Hospital Operations Management Code: BBA (HM) 101

со	Description: After the completion of the course student will be able
CO1	define various professional service units of a hospital (clinical and non-clinical).

CO2	build the concept of professional management and also management of Indian hospitalchallenges and strategies
CO3	develop command on the hospital planning-concept guiding principles in planning hospital facilities & services planning the hospital building stages in planning, finance, location, need assessment survey of community, factors determining site, legal requirements, design consideration, project management & implementation, gantt chart planning the operational units, engineering, lighting etc.
CO4	explain the use of organization of the hospital management structure governing body, hospital committees and hospital functionaries' duties and responsibilities of various levels of management
CO5	improve grip on different policies, sop & reporting issues, and challenges & innovations in hospital operations management

Paper: Hospital and Health Systems Code: BBA (HM) 102

со	Description: After the completion of the course student will be able
CO1	prioritize to Health Holistic approach to health Spectrum of health, Positive health, Changing concept of health, Dimensions of health, Determinants of health Indicators of health Concept of well-being.
CO2	demonstrate Hospital Overview of Professional service units of a hospital (Clinical & Nonclinical).
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CO3	importance to know the levels of healthcare delivery system
CO4	show how international health agencies working on public health.
CO5	explain how Indian hospital sector is fostering.

Paper: English Communication Code: BBA (HM) 104

со	Description: After the completion of the course student will be able
CO1	develop command in Understanding concepts of English grammar & vocabulary in communication.
CO2	perceive comprehensive facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating the main ideas given in written texts
CO3	apply acquired linguistic knowledge in producing various types of written texts.

CO4	interpret facts and ideas from aural inputs and Apply acquired linguistic knowledge in giving spoken response.
CO5	choose different processes of listening & strategies of effective listening to be a good speaker

Link: http://makautexam.net/aicte_details/SyllabusI/BBAHM/sem220.pdf

Paper: Medical Terminology Code: BBA (HM) 201

со	Description: After the completion of the course student will be able
CO1	identify structures and describe functions of each of the body systems.
CO2	formulate perception on common diseases and disorders within each of the body systems.
CO3	identify and interpret complex medical terms by breaking them into their component word parts in order to decipher their meaning.
CO4	build medical words from their component word parts.
CO5	explain different body positions with their names.

Paper: Hospital Overview Code: BBA (HM) 202

со	Description: After the completion of the course student will be able
CO1	apply concept of Modern Hospital & Privatization in Health Sector.
CO2	explain the functions of corporate multi-specialty hospital.
CO3	importance to know Public Sector Hospitals and Level of care / offered facilities.
CO4	originate cognition on Corporate Hospital in developing countries.
CO5	identify various types of IEC activities in health sector.

Paper: Environment & Sustainable Development Code: BBA (HM) 204

со	Description: After the completion of the course student will be able
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CO1	explain the knowledge base on ecosystem and types of environmental pollutions.
CO2	relate with the efforts that can be made at the Industry and Government level to improve the environment, the economy and the quality of life.
CO3	build basic understanding on sustainable development with a vision to balance our economic, environmental and social needs, allowing opulence for now and future generations.
CO4	illustrate the environmental issues and challenges.
CO5	recommend to know about the Biodiversity, threats to biodiversity & Ecosystem

Link : <u>http://makautexam.net/aicte_details/SyllabusI/BBAHM/sem320.pdf</u>

Paper: Medical Records Science Code: BBA (HM)-301

СО	Description: After the completion of the course student will be able
CO1	explain the Medical Records and its format and characteristics.

CO2	define about the coding indexing and Computerization.
CO3	build skill to perform Medical Audit.
CO4	explain the Organization and management of the medical records department.
CO5	illustrate knowledge about the legal aspects of medical records.

Paper: Health Care Marketing Code: BBA (HM)-302

со	Description: After the completion of the course student will be able
CO1	discuss fundamental marketing concepts, theories, and principles in areas of marketing.
CO2	illustrate the marketing environment.

CO3	classify marketing process, different types of products and services
CO4	demonstrate the tools used by marketing managers for making decisions under various situations.
CO5	explain how marketing theories benefit companies to surge.

Paper: Hospital Information Systems Code: BBA (HM)-303

со	Description: After the completion of the course student will be able
CO1	explain the Basic Information Concepts-Data and Information.
CO2	interpret the advantages of hospital Information services.
CO3	perceive clear concept about the different usage of Electronic Health Record Systems
CO4	prioritize to understand about the electronic communications Systems

CO5	analyze the basics of customer relationship management.

Paper: Computer Applications Code: BBA (HM)-305

со	Description: After the completion of the course student will be able
CO1	create employability skills and a commitment to professionalism by learning basic and important computer applications.
CO2	analyze a variety of advanced spreadsheet, operating system and word processing functions.
CO3	solve a range of problems using office productivity, applications and adapt to new software releases.
CO4	formulate quality assurance through critically evaluating procedures and results by applying office productivity applications.
CO5	interpret the concepts of spreadsheet, different formulas & charts of it.

Paper: Public Health and Health Care Planning Code: BBA (HM)-401

со	Description: After the completion of the course student will be able
CO1	define the history and philosophy of public health as well as its core values, concepts, and functions across the globe and in society.
CO2	adapt methods & tools of public health data collection, use, and analysis why evidence-based approaches are an essential part of public health practice.
CO3	apply the basic processes, approaches, and interventions that can identify and address the major health-related needs and concerns of populations
CO4	analyze the science of human health and disease to opportunities for promoting and protecting health across the life course.
CO5	examine the condition of socio-economic, behavioral, biological, environmental, and other factors that impact human health and contribute to health disparities.

Paper: Support Utility and Clinical Services I Code: BBA (HM)-402

СО	Description: After the completion of the course student will be able
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CO1	define different departments exist in a hospital, structure, workflow etc
CO2	demonstrate operation of various Line and Auxiliary departments within the hospitals
CO3	formulate grip by studying the operation support services to improve customer service, reduce process costs.
CO4	explain the structure, workflow etc. of various departments within a hospital.
CO5	show how the organizational hierarchy is important to properly manage the departments using the administrative point of view.

Paper: Hospital Inventory Management Code: BBA (HM)-403

со	Description: After the completion of the course student will be able
CO1	explain the dynamics of inventory management's principles, concepts, and techniques as they relate to the entire supply chain

CO2	develop skills to evaluate customer demand, distribution, and product transformation processes.
CO3	justify various devices and approaches used by organizations to obtain the right quantities of stock or inventory.
CO4	construct expertise with inventory management practices.
CO5	build concept on hospital inventory management

Paper: Basic Healthcare Analytics Code: BBA (HM)-405

со	Description: After the completion of the course student will be able
CO1	explain how to use health data to improve quality of an organization
CO2	formulate knowledge in the process of healthcare data analytics and the tools used in each step.
CO3	explain the general functions, purposes, and benefits of analytics in various healthcare and medical settings.

CO4	propose steps to familiarize with basic analytical techniques and visualization tools.
CO5	improve student's understanding on the application of different analytical techniques on datasets, collected from health care units.

Paper: Epidemiological Transitions in Healthcare Code: BBA (HM) -501

со	Description: After the completion of the course student will be able
CO1	illustrate the knowledge of Epidemiology and Disease.
CO2	outline the basic concepts of epidemiology its methods etc
CO3	show various types of dynamics of disease causation, transmission and prevention
CO4	examine various roles of hospitals in prevention of Epidemics.
CO5	propose various population-based perspectives to examine disease and health-related events

Paper: Support and Utility Services-II Code: BBA (HM)—502

со	Description: After the completion of the course student will be able
CO1	elaborate how to optimize and digitize all the processes within the hospitals.
CO2	adopt strategy to improve customer service, reduce process costs
CO3	define different departments that exist in a hospital, structure, workflow etc.
CO4	how much the organizational hierarchy is important to manage the departments properly using the administrative point of view
CO5	summarize different levels of services present in the hospital that make a hospital run smoothly, from environmental services, equipment distribution and linens facilities and many more.

Paper: Quality in Healthcare Code: BBA (HM) 601

со	Description: After the completion of the course student will be able
CO1	explain the fundamentals of Quality Management its objectives concept etc
CO2	analyze the concept of patient participation in quality health care.
CO3	discuss the concepts of Accreditation.
CO4	define the concepts of the TQM in healthcare.
CO5	elaborate how quality management procedure is adopted in industry.

Paper: Health Insurance Code: BBA (HM) 602

со	Description: After the completion of the course student will be able
CO1	build knowledge about the Health Insurance in Private Health Sector

CO2	analyze Different kinds of Health Insurance Policies.
CO3	discuss on GOI & State Govt. Policy in implementation of Health insurance.
CO4	explain Hospitals, TPA, Insurance Company, relationship and Problems
CO5	evaluate the IRDA guidelines to know how it is regulating the Insurance sector.

Program Name: BBA in Digital Marketing

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBADM/sem120.pdf

Introduction to Media and Computer Application in Business

Paper Code: BBA(DM) 101

со	Description: After the completion of the course student will be able
CO1	identify the employability skills and commitment to professionalism by learning basic and important computer applications.

CO2	explain a variety of advanced spreadsheet, operating system and word processing functions.
СОЗ	examine a range of problems using office productivity applications and adapt to new software releases.
CO4	make use of digital and social media related tools to plan & develop ad campaigns.

Paper Name: Business Economics Paper Code: BBA (DM) - 102

со	Description: After the completion of the course student will be able
CO1	classify the basic problems of an economy
CO2	develop an understanding about the market structure including pricing, labour, capital etc.
CO3	make use of macroeconomics related concepts to arrive at business decisions.
CO4	interpret public finance, international trade and finance

Paper Name: English Communication Paper Code: BBA(DM) 104

со	Description: After the completion of the course student will be able
CO1	identify the basic concepts of the usage of English grammar & vocabulary in communication
CO2	interpret facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating the main ideas given in written texts.
CO3	apply acquired linguistic knowledge in producing various types of written texts
CO4	analyze facts and ideas from aural inputs

Paper Name: Marketing Management Paper Code: BBA (DM) - 201

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBADM/sem220.pdf

со	Description: After the completion of the course student will be able

CO1	develop understanding of fundamentals of marketing concepts, theories, and principles in areas of marketing.
CO2	explain the role of consumer in the marketing program
CO3	apply the basic strategies of marketing in the organization
CO4	design effective marketing programs.

Paper Name: Organizational Behaviour Paper Code: BBA (DM)- 202

со	Description: After the completion of the course student will be able
CO1	demonstrate the applicability of the concept of organizational behavior to understand the behavior of people in the organization
CO2	illustrate the applicability of analyzing the complexities associated with management of individual behavior in the organization
CO3	relate with how the organizational behavior can align with the diverse culture of employees in mncs.

Paper Name: Environment & Sustainable Development Paper Code: BBA (DM) - 204

со	Description: After the completion of the course student will be able
CO1	explain the knowledge base on ecosystems and types of environmental pollution.
CO2	relate with the efforts that can be made at the industry and government level to improve the environment, the economy and the quality of life.
CO3	build basic understanding on sustainable development with a vision to balance our economic, environmental and social needs, allowing opulence for now and future generations.
CO4	illustrate the environmental issues and challenges

Paper Name: Business Research Methods Paper Code: BBA (DM) – 301

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBADM/sem320.pdf

СО	Description: After the completion of the course student will be able
CO1	explain the basic nature and purpose of research and its advantages to business.
CO2	make use of different research designs, data collection processes, tools, data cleaning and analysis techniques.
CO3	develop skills to write business research reports.
CO4	apply the understanding of various statistical tools and its application for data analysis and interpretation.

Paper Name: Business Research Methods-Practical Paper Code: BBA (DM) – 391

со	Description: After the completion of the course student will be able

CO1	make use of various classification and data presentation techniques on data sets.
CO2	apply central tendency and variance to check the nature of a data set.
CO3	inspect data types and control structures of an open-source programming language.
CO4	make use of an open-source programming language to get a basic understanding of hypothesis testing.

Paper Name: Financial Accounting and Management Paper Code: BBA (DM)- 302

со	Description: After the completion of the course student will be able
CO1	demonstrate the conceptual knowledge of financial accounting
CO2	transfer the skills for recording various kinds of business transactions from the very basics to a level of sole proprietorship business, partnership business to the level of company accounts.

CO3	create provision for depreciation and reserves and bank reconciliation for rectifying the errors
CO4	examine different statements of accounts to evaluate the firm's financial health.

Paper Name: Advertising and Brand Management Paper Code: BBA (DM) - 303

со	Description: After the completion of the course student will be able
CO1	explain the main concepts and the purpose of branding in real-life
CO2	demonstrate the process and methods of brand management, including brand identity and build brand equity.
CO3	formulate effective branding strategies for both consumer and business.
CO4	explain the role of advertising in marketing as well as advertising agencies and the process to make an advertising campaign.

Paper Name: Personality Development Paper Code: BBA (DM)-305

СО	Description: After the completion of the course student will be able
CO1	outline different components of the personality of human beings.
CO2	identify the various factors involved in self-assessment for professional development.
CO3	apply business and professional etiquette in real life.
CO4	make use of concepts, theories or issues in human development which will help become industry-ready.

Paper Name: Consumer Behaviour Paper Code: BBA (DM)-401

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBADM/sem420.pdf

со	Description: After the completion of the course student will be able
CO1	analyze consumer behaviour and its impact on buying patterns.

CO2	interpret the power of individual influences on decision-making and consumption.
CO3	explain consumer's perception in determining brand preferences
CO4	compile the components and stages of the individual decision- making process.

Paper Name: Integrated Marketing Communications Paper Code: BBA (DM) 402

со	Description: After the completion of the course student will be able
CO1	develop understanding about the principles and practices of marketing communications.
CO2	utilize various communication tools used by marketers to inform consumers.
CO3	outline the budget for marketing communication to reach consumers
CO4	organize a managerial framework for integrated marketing communications planning.

Paper Name: Digital Marketing and Content Development Paper Code: BBA (DM)-403

со	Description: After the completion of the course student will be able
CO1	develop understanding about digital marketing and its application
CO2	explain emerging trends in digital marketing and critically assess the use of digital marketing tools by applying relevant marketing theories and frameworks.
CO3	interpret the traditional marketing mix within the context of a changing and extended range of digital strategies and tactics.
CO4	apply various analytical tools used for digital marketing

Paper Name: R /Python Fundamentals Paper Code: BBA(DM) - 495

со	Description: After the completion of the course student will be able

CO1	develop understanding about data types, syntax and packages
CO2	construct a mechanism of how to import external data into R/Python for data processing and statistical analysis.
CO3	apply the main data structures in appropriate situations
CO4	examine basic summary statistics.

Paper Name: E-Commerce and M-Commerce Paper Code: BBA (DM) 501

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBADM/sem520.pdf

со	Description: After the completion of the course student will be able
CO1	demonstrate the basic concepts and technologies used in e- commerce and mcommerce.
CO2	develop knowledge about concepts, challenges, and security issues from a business perspective in the e-commerce and m-commerce domain.

СОЗ	develop an understanding about the concept and application of HTML.
CO4	apply the concept of e-business framework in real life scenario

Paper Name: Media Ethics and Law Paper Code: BBA (DM) 502

со	Description: After the completion of the course student will be able
CO1	develop the understanding of various ethical issues in media business.
CO2	interpret the importance and use of various codes and rules related to information technology.
CO3	assess and apply ethical approaches in data security and data privacy
CO4	apply the law and act related knowledge appropriately especially in media business

Paper Name: Project Management Paper Code: BBA (DM) 601

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBADM/sem620.pdf

со	Description: After the completion of the course student will be able
CO1	explain the concepts of project management from planning to execution of projects
CO2	interpret various steps as well as aspects involved in project management.
CO3	identify the importance of team in the successful execution of a project
CO4	compile the tools and techniques of project management along with application in proper context.

Paper Name: Data Visualization and Interpretation Paper Code: BBA (DM) 602 and BBA (DM) 692

СО	Description: After the completion of the course student will be able
CO1	understand the necessity of data visualization.

CO2	familiarization with basic types of data visualization techniques.
CO3	construct concept regarding when to use which charts in case of predictive and classification analytics
CO4	categorize different techniques/ data visualization in real life business scenario

Program Name: BBA(Travel & Tourism Management)

Syllabus Link: http://makautexam.net/aicte_details/Syllabusl/BBATTM/sem120.pdf

Paper code: BBA (TTM) – 101 Tourism Principles & Practices

со	Description: After the completion of the course student will be able
CO1	explain the fundamental concept, growth and development of tourism & historical development of tourism.
CO2	demonstrate the various elements of tourism, the framework of the system, types and forms of tourism as well as the impact of tourism

СОЗ	categorize travel formalities and documents required for international travel.
CO4	explain the tourism demand and supply as well as develop niche tourism concepts.

Paper Code: BBA (TTM) – 102 Principles of Management

СО	Description: After the completion of the course student will be able
CO1	make use of the process, functions, principles of management in business scenario
CO2	utilize effective communication for operating the organization.
CO3	apply the leadership ability to manage the workforce in organization
CO4	categorize various management issues to structure the organization for effective controlling in organization
CO5	examine the factors that foster organizational change

Paper Code: BBA (TTM)-104 Business Communication

со	Description: After the completion of the course student will be able
CO1	identify the basic concepts of the usage of English grammar & vocabulary in communication.
CO2	interpret facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating the main ideas given in written texts.
CO3	apply acquired linguistic knowledge in producing various types of written texts
CO4	analyze facts and ideas from aural inputs

Paper Code: BBA (TTM) -201 Transport in Travel & Tourism

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBATTM/sem220.pdf

СО	Description: After the completion of the course student will be able
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CO1	explain the development of passenger transport and how it facilitates tourism development, the framework for analyzing the tourist transport needs.
CO2	analyze the contemporary issues and challenges facing the transportation business that relates to the tourism industry & documentations related with various transport systems.
CO3	explain the framework that provides a means for understanding how tourists interact with transportation & learn about various case studies.
CO4	examine the complexity and relationships which coexist between tourism and transportation & transport management process in logistics as well as transport & environmental impact assessment.

Paper Code: BBA (TTM) -202 Travel Agency & Tour Operation Management

СО	Description: After the completion of the course student will be able
CO1	demonstrate the relevant knowledge and skills on the operations and management of tour and travel segments of tourism industry including trends and contemporary issues in the travel industry

CO2	explain about the various factors influencing the tour operator industry including setting up of travel agencies and legal aspects in travel and tour operations.
CO3	classify the personality, attitudes, values & knowledge and skills of tour operator's products which include travel, transfer and accommodation planning, brochure design, itinerary preparation.
CO4	explain and make use of formalities and factors associated with new organizational set up & knowledge about the various activities of organizations involved in the active development of the travel and tour operations across the globe.

Paper Code: BBA (TTM) -204 Environment & Sustainable Development

со	Description: After the completion of the course student will be able
CO1	explain the basics of environment and ecology, relationship with tourism, environmental degradation due to tourism and environment legislation to business enterprise.
CO2	analyze environmental friendly tourism practices, carrying capacities, laws and regulations associated with environmental friendly tourism practices.

CO3	construct better understanding the eco-friendly tourism practice guidelines along with various stakeholders' participation.
CO4	illustrate and analyze the conservation & public protected areas and relationship with tourism activities as well as visitors' management system.

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBATTM/sem320.pdf

со	Description: After the completion of the course student will be able
CO1	demonstrate the concept of tourism product as well as provide insights into the process of developing and managing various tourism products
CO2	illustrate the archaeological sites of India & types of Indian performing arts and its significance in tourism, simultaneously classify the Indian paintings as well as to better understand Indian rituals, dresses, cuisine with regional variations.
CO3	outline the major natural tourism products & available amenities in the Indian tourism destinations.

Paper Code; BBA (TTM)-301 Tourism Products & Destination Management

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CO4	outline destination management & analyze planning process, policies & strategies associated with it.
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Paper Code: BBA (TTM) -302 Introduction to Hospitality in Tourism

со	Description: After the completion of the course student will be able
CO1	explain the fundamental concept of accommodation and types of accommodation as well as relationship, role and importance of accommodation in tourism
CO2	demonstrate accommodation products, rating, classification system & challenges of hotel as well as understanding the impact of COVID-19 on the hotel industry.
CO3	outline management functions in the hotel industry & operational process as well as to learn about hotel languages, major facilities & services.
CO4	explain hotel reservation, payment system, cancellation & major administrative process.

Paper Code: BBA (TTM)-303 Tourism Economics

со	Description: After the completion of the course student will be able
CO1	explain the definition of economics & concepts of economics as well as discuss the nature, scope and importance of economical analysis along with tourism demands.
CO2	illustrate the theory of tourism supply and changes.
CO3	demonstrate cost of production, pricing methods of tourism & tourism multiplier effects.
CO4	analyze the impact of macro economy on the tourism industry as well as to assume the banking system & international trade.

Paper Code: BBA (TTM) 305 French-I

СО	Description: After the completion of the course student will be able
CO1	explain basics alphabets, number and gender, numbers, days, months, time, etc.
CO2	classify basic grammar in French.

CO3	explain translation, tourism related terms.
CO4	illustrate how to introduce yourself in French.

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBATTM/sem420.pdf

Paper Code: BBA (TTM)-401 Tourism Marketing

со	Description: After the completion of the course student will be able
CO1	explain fundamental concepts about marketing and the marketing process.
CO2	demonstrate MIS, marketing research, consumer markets and consumer behaviour, buyer decision process.
CO3	interpret the term "service marketing", how marketing is done in tour and travel services. explaining different types of services and how they put an impact to the customers as well as making student aware of the term market segmentation and explaining 9p's of marketing and how to identify the market
CO4	analyze the concept of product decision, destination life cycle and total quality management, simultaneously the role of branding and packaging in the marketing management.
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Paper Code: BBA (TTM) -402 Accounts & Finance for Tourism

СО	Description: After the completion of the course student will be able
CO1	explain in-depth view of the process in finance and accounts of the firm.
CO2	illustrate the general purposes and functions of accounting & developing knowledge on the allocation and funding of financial resources.
CO3	interpret the main elements of financial accounting information – assets, liabilities, revenue and expenses & identify the main financial statements and their purposes.
CO4	demonstrate and classify the problems & challenges of financial management in the hospitality industry as well as scope, opportunities and challenges for investment in hotel, aviation and tourism sectors.

Paper Code: BBA TTM -403 Organizational Behaviour & HRM in Tourism

со	Description: After the completion of the course student will be able
CO1	explain the nature, meaning and significance of organizational behaviour, challenges and opportunities for organizational behaviour & perception.
CO2	demonstrate the role of the motivation through different theories & giving the concept of learning and techniques of administration
CO3	illustrate the theory of attitude and how it is related to job satisfaction, manage stress as well as analyse the concept of group and the factors affecting the group
CO4	explain the application of human resource management in tourism, aviation and hospitality industry

Paper Code: BBA (TTM) -405 French II

СО	Description: After the completion of the course student will be able
CO1	illustrate conjugation of verbs

CO2	explain the formation of sentences in French.
CO3	classify various tenses.
CO4	explain advanced grammar in French.

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBATTM/sem520.pdf

Paper Code: BBA (TTM) -501 Event Tourism & Public Relations

со	Description: After the completion of the course student will be able
CO1	demonstrate and categorize different aspects and functions of event tourism.
CO2	make use of successful events that can generate revenue.
CO3	interpret the marketing function of event tourism.
CO4	illustrate & categorize various strategies of public and media relations.

Paper Code: BBA (TTM) -502 Entrepreneurship & Community Development in Tourism

со	Description: After the completion of the course student will be able
CO1	interpret the concepts of entrepreneurship and the role of an entrepreneur in economic development.
CO2	list various steps as well as aspects involved in entrepreneurship in India.
CO3	examine the impact of social & community-based entrepreneurship in tourism.
CO4	apply various tools and techniques in solving real life problems in developing tourism entrepreneurship.

Paper Code: BBA (TTM) -503A Travel Agency & Tour Operation Management I

со	Description: After the completion of the course student will be able
CO1	develop adequate knowledge and skills applicable to the travel industry.
CO2	recall and explain in details of the fundamentals and advance areas of itinerary

CO3	interpret the current trends and practices in the tourism and travel trade sector.
CO4	develop adequate knowledge of frontier formalities and documentation for smooth operation.

Paper Code: BBA (TTM) -503B MICE Management I

со	Description: After the completion of the course student will be able
CO1	demonstrate MICE management
CO2	illustrate and compare conference and meeting from general event planning.
CO3	explain MICE travel as a global management tool used as an exceptional travel experience to motivate and recognize participants for increased levels of performance in support of organizational goals

CO4	discover sufficient opportunities to use knowledge and skill in MICE tourism.
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Paper Code: BBA (TTM) -503C Airline & Cargo Management I

со	Description: After the completion of the course student will be able
CO1	demonstrate the structure and dynamics of the aviation industry.
CO2	explain various operations and management of the aviation industry.
CO3	illustrate the rules for cargo operations.
CO4	examine the role of IATA, DGCA. AAI and ICAO.

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BBATTM/sem620.pdf

Paper Code: BBA (TTM) -601 ICT & E-Tourism

со	Description: After the completion of the course student will be able

CO1	demonstrate a good understanding of origins and basic layout of computers along with its influence on society and tourism industry
CO2	illustrate E-Tourism and its strategies.
СОЗ	apply technology used in tourism and marketing.
CO4	explain the utilization of the advancement in information technology in tourism business

Paper Code: BBA (TTM) -602 Travel Preparation, Safety and Wellness

со	Description: After the completion of the course student will be able
CO1	explain the fundamentals of recreation and leisure.
CO2	illustrate the link between leisure, recreation & tourism as well as Post-COVID tourism scenario and protocols.
CO3	demonstrate the linkage between lifestyle, and tourism as well as explore the future of health and wellness tourism.

CO4	relationships between responsibilities & ethical practices of all the stakeholders of tourism.

Paper Code: BBA (TTM) -603A Travel Agency & Tour Operation Management II

СО	Description: After the completion of the course student will be able
CO1	experiment of tour package and other aspects as well as discover ideas about brochure designing
CO2	illustrate the concepts of tour guiding & develop skills for effective tour guiding techniques.
CO3	demonstrate the techniques of visitor interpretation.
CO4	explain applicable various laws, consumer services & complaint handling techniques.

Program Name: MBA

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MBA/AllSem.pdf

MB 101: MANAGERIAL ECONOMICS (MICRO)

СО	Description: After the completion of the course student will be able
CO1	Identify the basics of Managerial economics
CO2	Analyze the core concepts of Economics which are necessary for managers
CO3	Classify different economic goals of managers
CO4	Classify alternative market structures for corresponding managerial decision making
CO5	Estimate the prices under different situations of an economy

MB: 102 ORGANIZATIONAL BEHAVIOUR

СО	Description: After the completion of the course student will be able

CO1	Develop the concepts of various components including structure & design of Organization
CO2	Interpret individual behaviour in the organizational settings.
CO3	Discuss various work motivation and leadership principles for managing employees behaviour in the organization
CO4	Elaborate the complexities associated with management of individual behaviour in the organization
CO5	Interpret the complexities of group behaviour in the organization

MB 103: BUSINESS COMMUNICATION

со	Description: After the completion of the course student will be able
CO1	Explain the purpose of business communication
CO2	Illustrate the stages of writing different documents relevant to business communication

CO3	Discuss different aspects of internal communication of a business organization
CO4	Develop different important concepts of external communication
CO5	Organize different ways of handling business information

MB 104: LEGAL AND BUSINESS ENVIRONMENT(MICRO& MACRO)

со	Description: After the completion of the course student will be able
CO1	List the legal terms commonly used in business
CO2	Select various legal alternatives
CO3	Develop concept of business contracting
CO4	Evaluate the methodology of settlement of commercial disputes
CO5	Identify few economic indices and how they affect business

MB 105: INDIAN ETHOS AND BUSINESS ETHICS

СО	Description: After the completion of the course student will be able
CO1	Assess the relationship between ethics and business and relate the subsequent theories of justice and economics across different cultural traditions.
CO2	Examine the relationship between ethics, morals and values in the workplace
CO3	Analyze and understand various ethical philosophies to explain how they contribute to current management practices.
CO4	Apply understanding of ethics of real-world contexts.
CO5	Assess the importance of building moral goals in business and devising effective ways to fulfill it.

MB 106: QUANTITATIVE TECHNIQUES

со	Description: After the completion of the course student will be able

CO1	Explain basic concepts of operations planning
CO2	Classify Manufacturing systems
CO3	Apply the concepts of inventory management in given situations
CO4	Analyze the factors in plant location and layout decisions
CO5	Discuss the issues involved plant maintenance

MB 201: INDIAN ECONOMY AND POLICY

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СО	Description: After the completion of the course student will be able
CO1	Identify the basic macro issues of an economy
CO2	Elaborate different indicators of Indian economy

CO3	Analyze different economic reforms of Indian economy
CO4	Classify the core economic policies
CO5	Apply the knowledge of economic policy studying the trade policy reform of India

MB 202: FINANCIAL REPORTING, STATEMENT AND ANALYSIS

со	Description: After the completion of the course student will be able
CO1	Summarize different accounting procedures and standards
CO2	Explain the concepts of financial accounting and accounting standards
CO3	Develop the skills of students to record financial transactions in different forms of books of accounts.

CO4	Classify management accounting concepts with the cost accounting concepts
CO5	Make use of the interpretation of financial statements for managerial decisions

MB 203: MARKETING MANAGEMENT

со	Description: After the completion of the course student will be able
CO1	Analyze the importance of the customer/consumer in the context of business, the growth of and the role played by Marketing Management as one of the functional areas of modern business organizations in order to achieve overall business objectives
CO2	Access the role played by the various dynamic actors and factors in the firm's micro and macro-environment and how marketing as a function will have to respond to the ever-changing external environment.
CO3	Apply the various concepts in relation to the 4 verticals within Marketing, namely the Product, Price, Promotion and Place in order to arrive at balanced marketing decisions.

CO4	Formulate marketing strategies pertaining to the aforesaid verticals at different stages in the life-cycle of goods/services in order to arrive at important functional level decisions that are aligned with corporate goals.

MB 204: OPERATIONS MANAGEMENT

со	Description: After the completion of the course student will be able
CO1	Understand production and the development of operations
CO2	Explain the different aspects of Operation Management: Manufacturing,Service andProject Management in the value addition process.
CO3	Understand the purchasing strategy and inventory management
CO4	Apply the short term planning process through Planning Techniques, Production Planning, and Shop Floor scheduling.
CO5	Analyze the Quality Systems for proactive system development to prevent defects and control process defects.

MB - 206: HUMAN RESOURCE MANAGEMENT

СО	Description: After the completion of the course student will be able
CO1	Interpret the terms used in HRM
CO2	Apply the knowledge in day to day working
CO3	Compare between various options in HRM
CO4	Evaluate the human capital
CO5	Formulate HR policies and procedures

MB 301: ENTREPRENEURSHIP & PROJECTMANAGEMENT

со	Description: After the completion of the course student will be able
CO1	Discuss the concepts of Project Management from planning to execution of projects

CO2	Apply Project Appraisal & Management techniques and Analyze the techniquesPERT & CPM for Project planning, scheduling and Execution Control.
СОЗ	Develop the strategies employed in managing project risk & termination
CO4	Discuss the nature of entrepreneurship and have the ability to discern distinct entrepreneurial traits.
CO5	Assess personal attributes that enable best use of entrepreneurial opportunities and also know the parameters to assess opportunities and constraints for new business ideas.

MB 302: CORPORATE STRATEGY

со	Description: After the completion of the course student will be able
CO1	Differentiate between the nature of Strategic Decisions andOperational/Administrative Decisions.
CO2	Undertake an external environment analysis and an internal environment analysis for a firm.
CO3	Analyze the various forces of competition for a firm.

CO4	Design a road map for implementation of strategic decisions for a firm
CO5	Assess and evaluate the performance of strategic decisions taken by a firm

MM 303: IMC/ PROMOTION STRATEGY

СО	Description: After the completion of the course student will be able
CO1	Explain the basic concept of IMC and its relevance to marketing promotion
CO2	Illustrate different elements of IMC and distinguish between their features
CO3	Evaluate the growth, prospect and types of sales promotion and their importance in marketing
CO4	Organize the concept of advertising and media planing, budgeting

MM 304: MARKETING RESEARCH

СО	Description: After the completion of the course student will be able
CO1	Explain the role of Marketing Research as a tool for making better marketing decisions, its scope, it's process, its importance and its utility in solving problems in the domain of marketing.
CO2	Develop an end-to-end research design, formulate the research problems, set up the research objectives and identify the information needs and the sources from which such information can be collected.
CO3	Design suitable data collection methods & instruments, use different types of scales formeasurement of data, organize field data collection and choose appropriate data analysis plans.
CO4	Construct research hypotheses, test them using different criteria, analyze datausing different dataanalysis techniques

CO5	Interpret data into findings, draw certain conclusions, propose certainrecommendations andcompile a research report.

FM 301: TAXATION

со	Description: After the completion of the course student will be able
CO1	Explain the basic concept of taxation system in India
CO2	Analyse the residential status of different assesses and tax liability
CO3	Identify planning, exemption, deduction, rebate, relief and other ways to reduce tax liability
CO4	Assess the Taxable Income of Individual, HUF, Firm and Corporate and different Heads of Income likeSalaries, Income from House Property etc
CO5	Identify Indirect tax system in India and Levy and Collection of Tax system under GST rules

FM 302: PROJECT APPRAISAL AND FINANCE

со	Description: After the completion of the course student will be able
CO1	Construct the levels of basic operations research concepts and terminology involved in optimizationtechniques
CO2	Interpret and solve business-related problems
CO3	Apply certain mathematical techniques in getting the best possible solution to a problem involvinglimitedresources
CO4	Apply the most widely used quantitative techniques in decision making
CO5	Identify project goals, constraints, deliverable s, performance criteria, control needs, and resourcerequirementsin order to achieve project success

FM 303: BEHAVIORAL FINANCE

со	Description: After the completion of the course student will be able
CO1	Compare the various financial systems in India

CO2	Classify the structure of commercial banks and mutual funds
CO3	Develop knowledge of the various financial and securities markets
CO4	Interpret Lease and hire purchase system
CO5	Construct knowledge on Managers, underwriting, bankers.

FM 304: CORPORATE FINANCE

со	Description: After the completion of the course student will be able
CO1	To extend basic knowledge on the on corporate finance and goal of financial management
CO2	To classify different finance functions including capital structure, financing mix and the dividend decision criterion

СОЗ	To choose different capital budgeting technique by considering conventional and non-conventional cash flows
CO4	To analyse market efficiencies and anomalies in corporate finance
CO5	To build the strong understanding between managers and owners goal

OM 301: SUPPLY CHAIN AND LOGISTICSMANAGEMENT

СО	Description: After the completion of the course student will be able
CO1	EXPLAIN the important role of Supply Chain Management in business operations
CO2	DISCUSS current supply chain management trends
CO3	EXPLAIN the role of information & communication technology in supply chain management
CO4	APPLY the principles of supply chain management in logistical decision-making

OM 302: OPERATIONS STRATEGY

со	Description: After the completion of the course student will be able
CO1	DEVELOP a bird's eye view of utilizing organizational resources through continuous improvement of business parameters
CO2	EVALUATE and APPLY appropriate operation strategy to reconcile with market requirements
CO3	ANALYZE global quality management system
CO4	ANALYZING of strategies for improving quality and productivity
CO5	EVALUATE operation strategy as part of organisational strategy & mission

OM 303: QUALITY TOOLKIT FOR MANAGERS

СО	Description: After the completion of the course student will be able
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CO1	DISCUSS the importance of Quality and Quality Management
CO2	EXPLAIN the Quality Philosophies behind the modern approaches to quality management
CO3	EXPLAIN the quality concepts such as Lean Manufacturing, Cost of Quality, and Continuous ProcessImprovement
CO4	APPLY commonly used statistical quality control tools.
CO5	ANALYZE issues related to Six Sigma implementation.

OM 304: PRICING & REVENUE MANAGEMENT

со	Description: After the completion of the course student will be able
CO1	Understand pricing and revenue management with respect to operations management
CO2	Analyze the impact of different types of pricing and optimization and economy on revenue management
CO3	Illustrate demand forecasting for dynamic pricing

CO4	Develop Network and Capacity Control ideas in Revenue Management
CO5	Formulate pricing and revenue management in various fields

SPECIALIZATION: HUMAN RESOURCE MANAGEMENTHR

301: TEAM DYNAMICS AT WORK

со	Description: After the completion of the course student will be able
CO1	Discuss the foundation of groups and teams, group dynamics and thedifferent types of decision-makingtechniques at the workplace
CO2	Illustrate the development of organizational behavior and its importance ininterpersonal competence andteam effectiveness
CO3	Evaluate the complexities of managing teams efficiently.
CO4	Assess the various types of team interventions and the significance of communication and creativitystrategies for organizational effectiveness

HR 302: HUMAN RESOURCE METRICS ANDANALYTICS

СО	Description: After the completion of the course student will be able
CO1	Understand the growing importance of Analytics in HRM
CO2	Develop an idea on the functioning of HRM , in creating value in terms of business
CO3	Create figures from intangibles in HRM, and foster Decision Making
CO4	Organize qualitative factors of HRM for better People Management
CO5	Create new ways in terms of Employee Management utilizing an Data Driven Approach
CO6	Apply HRM as a strategic business function

HR 303: CROSS CULTURAL MANAGEMENT

со	Description: After the completion of the course student will be able

CO1	Develop the importance of culture and its various dimensions in managing the organization
CO2	Classify the issues of diverse workforce belong to various culture and ethnicity within the organization
CO3	Develop the concept of negotiation and effective decision making in a multi-cultural organization setting
CO4	Illustrate global Human resource management
CO5	Develop critical thinking and analytical skills through the case studies

HR 304: ORGANIZATIONAL DESIGN

со	Description: After the completion of the course student will be able
CO1	Create the most suitable organisation
CO2	Evaluate the importance of designing an organisation

СОЗ	Construct organisation structure
CO4	Categorise orgnisation functioning
CO5	Design organisation depending on chnges in business operations

SPECIALIZATION: BUSINESS ANALYTICS BA 301: MODELING TECHNIQUES

со	Description: After the completion of the course student will be able
CO1	Explain Data Modeling concept, types and applications
CO2	Illustrate different strategies for data per-processing
CO3	Apply learned concepts to build prediction and classification models aims to solve businessrelated problem.

CO4	Interpret the outcomes or results of various prediction and classification models
CO5	Choose proper statistical model for a business situation for smooth and fast decision making

BA 302: APPLICATION OF ANALYTICS IN BUSINESS

СО	Description: After the completion of the course student will be able
CO1	Explain marketing analytics concept, principles and applications.
CO2	Illustrate different types of prediction and classification techniques, popularly used in business
CO3	Apply learned concepts to build models aims to solve business related problem.
CO4	Interpret the outcomes or results of various statistical techniques.
CO5	Choose proper statistical model for a business situation for smooth and fast decision making.

BA 303: BUSINESS FORECASTING

СО	Description: After the completion of the course student will be able
CO1	Apply the concept, meaning as well as the importance and different methods of Business Forecasting and the applicability and importance of the each of the methods of Business Forecasting in the ManagementDecision Making using previous few years Data of the Organization
CO2	Analyze the existing system, followed by application of strategies, way of operations of the existingOrganizational Forecasting System, making improvement with the application or introduction of newand improved Forecasting systems based on the requirement and type of Operation of the organization
CO3	Evaluate and Analyze different aspect of Business Forecasting, viz forecasting of Sales for the comingyears,Forecasting of Marketing Budget and return, Forecasting of Labor requirement based on SalesForecast, Budget requirement based on the Sales Forecast, etc. Evaluation of Business Forecasting methods andForecastingapplications for better performance of actual versus Forecast
CO4	Implement concepts of Business Forecasting at present situation, creating a system for Mathematicalmodelling, Statistical hypothesis analysis, econometric analysis, Time series analysis of the data of thepreviousyears to model the

	forecast of the coming years, Linear and non linear modelling, univariate andmultivariate analysis of Organizational data to have a better forecast of the coming years, creation asystem in the organization based on R and R studios, Analysis of the historical data using R and Rstudio, coding in R for Business Forecasting to be applied in the organization
CO5	Apply the difference between the types of Forecasting methods using the architecture of DataAnalytics,application of Analytics and forecasting, use of application like R. Connecting R studio withOrganizational data base to analyze the historical data and make forecast. Analysis of the existing Forecasting toolsandupgrading it with updated system for better performance

BA 304: DATA SCIENCE USING R

СО	Description: After the completion of the course student will be able
CO1	DEVELOP basic knowledge of variable and syntax
CO2	EVALUATE and APPLY appropriate syntax and operation for coding
CO3	ANALYZE the code segment for applying syntax real life problem

CO4	ANALYZING of the code segment for debug the real life problem
CO5	EVALUATE the real life problem set

MM 401: CONSUMER BEHAVIOUR

со	Description: After the completion of the course student will be able
CO1	Explain the consumer's decision-making process and to look at marketing programsfrom the point of view of the consumer.
CO2	Apprise the different individual determinants that influence consumers'decision-making – the various psychological constructs that make everyconsumer unique.
CO3	Appreciate the impact of different external factors in the consumer'senvironment thathave a bearing on his choice process.
CO4	Understand of the consumer's buying process and make suitable adjustments in the firm's marketing program for better marketing outcomes.

MM 402: RETAIL MANAGEMENT

со	Description: After the completion of the course student will be able
CO1	Describe basic concepts in retail management.
CO2	Describe the strategies existing in the retail managements.
CO3	Discuss about the different opportunities available in selecting a location
CO4	Discuss about the different store layouts & designs existing in the retail management
CO5	Explain the various pricing approaches available in the retail marketing

MM 403: SALES & DISTRIBUTION MANAGEMENT

СО	Description: After the completion of the course student will be able
CO1	Understand role of personal selling and its management as a component of IntegratedMarketing Communications, its uniqueness, its application and its relationship with the other components of IMC.

CO2	Organize nuances of personal selling, the art and craft of salesmanship, the sales cycle, the different types of selling situations and some characteristics of successful salespersons.
CO3	Implement the various functions of sales force management like recruitment,selection, training, equipping & motivating the sales force, designing sales territories & quotas, sales force compensation and management of salesperformance.
CO4	Decide pertaining to setting up of distribution channels & their management, Thisbased on an understanding of their different formats, functions, specializations, capabilities & constraints.

MM 404: SERVICE MARKETING

со	Description: After the completion of the course student will be able
CO1	Understand the importance and criticality of services marketing .
CO2	Understand and apply the seven marketing mixes in the area of services marketing
СОЗ	Appreciate the differentiating role of services marketing in today's business context
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CO4	Understand and relate to the issues of marketing in terms of customer expectation and develop a servicesstrategy.
CO5	Develop an understanding of services marketing in multiple sectors.

MM 405: PRODUCT & BRAND MANAGEMENT

СО	Description: After the completion of the course student will be able
CO1	Develop perspective on various aspects of managing products successfully and developing strongbrands, Determine variables that drive the success of brands and product lines and the interrelationshipsamongthese variables.
CO2	Utilize practical tools to interpret, relate and evaluate product and brand strategies in an array ofcustomer and competitive contexts and Evaluate strategies for brand management at the global level andadapt them to suit the requirement of managing the brand in different cultural contexts.

СОЗ	Examine the importance of the ethical dimension in new product innovations and brand building
CO4	Discuss the process and methods of brand management, including how to establish brand identity andbuildbrand equity.
CO5	Compose, assess, and incorporate individual input to produce effective team project output for thepurposeof branding and product management.

MM 406: INTERNATIONAL MARKETING

со	Description: After the completion of the course student will be able
CO1	Explain major concepts and issues of international marketing
CO2	Assess the cross cultural issues in the internationalization of firms

СОЗ	Analyze emerging trends in international markets
CO4	Assess the role of regional agreements and public policy in in international marketing
CO5	Identify and evaluate different frameworks for market entry strategies in the international market

SPECIALIZATION: FINANCE

FM 402: MANAGING BANKS & FINANCIALINSTITUTIONS

со	Description: After the completion of the course student will be able
CO1	Apply the concept, meaning, importance and significance of Securities & Portfolio
CO2	Apply strategies to define goals, functions, of securities, risk involved in business, securities valuation
CO3	Evaluate and Analyze the fundamentals & technical aspects of security analysis

CO4	Implement concepts of different theories in securities and portfolio management andContemporary issues inportfolio management,
CO5	Apply the concepts like portfolio diversification, Construction, portfolio management, portfolio revision,portfolio evaluation, portfolio protection, portfolioperformance measures
CO6	Implement strategies to make an Impact on the students in taking investment decisions, and properly managethe portfolio

FM 403: MERGERS, ACQUISITIONS & CORPORATERESTRUCRING6

со	Description: After the completion of the course student will be able
CO1	Identify the basics Forms of Business Alliances, Strategic choice of type of business,types ofMergers,History of Mergers .
CO2	Distinguish different strategic processes, Synergies, defining and selecting targets,pricing ofMergers,negotiations approach, Acquisitions and take over.
CO3	Illustrate the techniques of valuing Firms,product life cycle effect,corporate Restructuring,divestituresmechanism,Value creation.

CO4	Discuss techniques of Accounting for Mergers, Financing Mergers, commonly takeovertactics, Internationaltakeover and Restructuring.
CO5	Discuss the legal aspects of M&A,provisions of companies Act,SEBI regulations,schemes ofAmalgamation,courts approval.
CO6	Understand the basic concepts of How and when to apply Valuation technique-Financialmodelling tools,S

FM 404: FINANCIAL DERIVATIVES

СО	Description: After the completion of the course student will be able
CO1	Identify different contracts in derivative market
CO2	Illustrate different types of margin

СОЗ	Discuss the types of credit derivatives
CO4	Apply different concepts of option strategies
CO5	Evaluate option Greek

FM 406: FINANCIAL MARKETS AND SERVICES

со	Description: After the completion of the course student will be able
CO1	Discuss the Indian Financial System and multiplicity of Financial Instruments
CO2	Organize money market, Primary market and Secondary market and compare it with the developed market
CO3	Examine Mutual Funds and Merchant Banking under the nodal agency SEBI
CO4	Determine Financial Services and Credit rating Agencies in India

CO5	Discover merchant banking lease/hire purchase and other
	financial services

OM 401: SALES & OPERATIONS PLANNING

СО	Description: After the completion of the course student will be able
CO1	Explain basic concepts of operations planning
CO2	Explain concepts of sales & operations planning (SOP), aggregate operationsplanning, operations scheduling
CO3	Explain concepts of demand forecasting and capacity planning
CO4	Apply the elements of sales & operations planning in given situations
CO5	Evaluate different parameters of sales & operations planning in given situations

OM 402: BEHAVIORAL OPERATIONS MANAGEMENT

со	Description: After the completion of the course student will be able
CO1	Illustrate behavioral operations management
CO2	Model cycles of experimental learning
CO3	Plan motivation and performance in work design
CO4	Analyze incentives and rewards in operations
CO5	Classify supply chain negotiator

OM 403: OPERATIONS RESEARCH APPLICATIONS

со	Description: After the completion of the course student will be able
CO1	Classify linear programming, goal programming and non-linear programming

CO2	Apply non-linear programming, goal programming, dynamic programming and non-linear programming
CO3	Analyze linear and non-linear programming
CO4	Apply data envelopment analysis, Marcov chain, Forecasting and Queing Theory
CO5	Evaluate data envelopment analysis, queing theory, Markov Chains and Forecasting

OM 404: SUPPLY-CHAIN ANALYTICS

со	Description: After the completion of the course student will be able
CO1	Explain better supply chain visibility
CO2	Develop data-driven rules to manage volatility
CO3	Plan inventory flow of goods and services

CO4	Forecast demand, predict and monitor supply and replenishment policies
CO5	Analyze and Model supply chains

OM 405: MANAGEMENT OF MANUFACTURINSYSTEM

СО	Description: After the completion of the course student will be able
CO1	Explain basic concepts of manufacturing systems
CO2	Apply the concepts of manufacturing systems design
CO3	Apply the concepts of synchronous manufacturing in given situations
CO4	Apply the concepts of Just-in-Time manufacturing systems in given situations
CO5	Analyze the design of cellular manufacturing layout

OM 406: SOURCING MANAGEMENT

со	Description: After the completion of the course student will be able
CO1	Explain conceptual knowledge about the procurement and sourcing management
CO2	Understanding of laws of Procurement
CO3	Understand and Apply the processes of sourcing management
CO4	Analyze competency to vendor selection and rating
CO5	Analyze the importance of effective sourcing

SPECIALIZATION: HUMAN RESOURCEMANAGEMENT

HR401: MANPOWER PLANING, RECRUITMENT AND SELECTION

CO	Description: After the completion of the course student
	will be able

CO1	Plan the effective deployment of human resource in the organization
CO2	Make use of various methods and techniques HR demand forecasting
CO3	Classify the factors that affect manpower planning
CO4	Examine different HR Audit methods for the effective utilization of humanresources inthe organization evaluate various recruitment and selectionstrategies for onboarding employees in the organization

HR 402: EMPLOYEE RELATIONS & LABOUR LAWS

СО	Description: After the completion of the course student will be able
CO1	Define terminologies used in IR and labour laws
CO2	Understand the importance of employee relations in an organization
CO3	Apply the knowledge in day day work

CO4	Analyze situations and find out solutions
CO5	Evaluate from time to time, the relationship to take corrective action.

HR 403: COMPENSATION AND BENEFITSMANAGEMENT

со	Description: After the completion of the course student will be able
CO1	Define terminologies used in IR and labour laws
CO2	Understand the importance of employee relations in an organization
CO3	Apply the knowledge in day day work
CO4	Analyze situations and find out solutions
CO5	Evaluate from time to time, the relationship to take corrective action.

HR 404: PERFORMANCE MANAGEMENT SYSTEMS

СО	Description: After the completion of the course student will be able
CO1	Identify various challenges of performance management system in theorganization
CO2	Develop an effective performance management system applicable in theorganization
CO3	Plan effective monitoring method for performance management
CO4	Classify various financial and non-financial reward system formanaging effectiveperformance of the employees
CO5	Measure various drivers of employee engagement for the benefit oforganization

SPECIALIZATION: BUSINESS ANALYTICS

BA 401: DATA VISUALIZATION FOR MANAGERS

со	Description: After the completion of the course student will be able
CO1	Explain basic concepts of data visualization for managers
CO2	Apply the data warehousing techniques for real world problem
CO3	Apply the algorithm of data warehousing techniques of real problem
CO4	Apply the data set which is more suitable for data warehousing
CO5	Analyze the data set behaviour on applying data warehousing

BA 402: BIG DATA TECHNOLOGY

СО	Description: After the completion of the course student will be able
CO1	Explain basic concepts on big data technology
CO2	Apply the big data technology on given data set

СОЗ	Apply the big data technology on real life problem
CO4	Apply the big data technology on the appropriate data set
CO5	Analyze the data set using big data technology

BA 404: DATA MINING

СО	Description: After the completion of the course student will be able
CO1	Explain the basic concept of data mining
CO2	Apply the data mining tools on given data set
CO3	Apply data mining algorithm on iris data set
CO4	Apply the classification and clustering on data set
CO5	Analyze the corresponding data set using data mining tools

BA 405: DATA ANALYTICS USING PYTHON

СО	Description: After the completion of the course student will be able
CO1	Explain variables, expressions, statements, conditions and operations, data structures used in Python
CO2	Illustrate the Object-Oriented Programming concepts applicable to Python.
CO3	Apply in-built functions to solve various business related situation for faster decision making.
CO4	Distinguish various exception handling modules and outcomes of regular expression.
CO5	Build user-defined function to solve various business related situation for faster decision making

Program Name: MBA in Business Analytics

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MBABA/AllSem20.pdf

MB (BA) 101: MANAGERIAL ECONOMICS (MICRO)

со	Description: After the completion of the course student will be able

CO1	Identify the basics of Managerial economics
CO2	Analyze the core concepts of Economics which are necessary for managers
CO3	Classify different economic goals of managers
CO4	Classify alternative market structures for corresponding managerial decision making
CO5	Estimate the prices under different situations of an economy

MB (BA) 102 : ORGANIZATIONAL BEHAVIOUR

со	Description: After the completion of the course student will be able
CO1	Develop the concepts of various components including structure & design of organization
CO2	Interpret individual behaviour in the organizational settings
CO3	Discuss various work motivation and leadership principles for managing employee's behaviour in the organization

CO4	Elaborate the complexities associated with management of individual behaviour in the organization
CO5	Interpret the complexities of group behaviour in the organization

MB (BA) 103: BUSINESS COMMUNICATION

СО	Description: After the completion of the course student will be able
CO1	Explain the purpose of business communication
CO2	Illustrate the stages of writing different documents relevant to business communication
CO3	Discuss different aspects of internal communication of a business organization
CO4	Develop different important concepts of external communication
CO5	Organize different ways of handling business information

MB (BA) 104: LEGAL AND BUSINESS ENVIRONMENT (MICRO AND MACRO)

СО	Description: After the completion of the course student will be able
CO1	List the legal terms commonly used in business
CO2	Select various legal alternatives
CO3	Develop concept of business contracting
CO4	Evaluate the methodology of settlement of commercial disputes
CO5	Identify few economic indices and how they affect business

MB (BA) 105: INDIAN ETHOS AND BUSINESS ETHICS

СО	Description: After the completion of the course student will be able
CO1	Assess the relationship between ethics and business and relate the subsequent theories of justice and economics across different cultural traditions

CO2	Examine the relationship between ethics, morals and values in the workplace
CO3	Analyze and understand various ethical philosophies to explain how they contribute to current management practices
CO4	Apply understanding of ethics of real-world contexts
CO5	Assess the importance of building moral goals in business and devising effective ways to fulfil it

MB (BA) 106: QUANTITATIVE TECHNIQUES

СО	Description: After the completion of the course student will be able
CO1	Explain basic concepts of operations planning
CO2	Classify Manufacturing systems
CO3	Apply the concepts of inventory management in given situations
CO4	Analyze the factors in plant location and layout decisions

MB (BA) 201: INDIAN ECONOMY AND POLICY

СО	Description: After the completion of the course student will be able
CO1	Identify the basic macro issues of an economy
CO2	Elaborate different indicators of Indian economy
CO3	Analyze different economic reforms of Indian economy
CO4	Classify the core economic policies
CO5	Apply the knowledge of economic policy studying the trade policy reform of India

MB (BA) 202: FINANCIAL REPORTING, STATEMENT AND ANALYSIS

со	Description: After the completion of the course student will be able

CO1	Summarize different accounting procedures and standards
CO2	Explain the concepts of financial accounting and accounting standards.
CO3	Develop the skills of students to record financial transactions in different forms of books of accounts.
CO4	Classify management accounting concepts with the cost accounting concepts
CO5	Make use of the interpretation of financial statements for managerial decisions

MB (BA) 203: MARKETING MANAGEMENT

со	Description: After the completion of the course student will be able
CO1	Analyze the importance of the customer/consumer in the context of business, the growth of and the role played by Marketing Management as one of the functional areas of modern business organizations in order to achieve overall business objectives.
CO2	Access the role played by the various dynamic actors and factors in the firm's micro and macro-environment and how marketing as a function will have to respond to the ever- changing external environment
CO3	Apply the various concepts in relation to the 4 verticals within Marketing, namely the Product, Price, Promotion and Place in order to arrive at balanced marketing decisions

functional level decisions that are aligned with corporate goals.

MB (BA) 204: OPERATIONS MANAGEMENT

СО	Description: After the completion of the course student will be able
CO1	Understand production and the development of operations
CO2	Explain the different aspects of Operation Management: Manufacturing, Service and Project Management in the value addition process.
CO3	Understand the purchasing strategy and inventory management
CO4	Apply the short-term planning process through Planning Techniques, Production Planning, and Shop Floor scheduling.
CO5	Analyze the Quality Systems for proactive system development to prevent defects and control process defects.

MB - 206: HUMAN RESOURCE MANAGEMENT

со	Description: After the completion of the course student will be able

CO1	Interpret the terms used in HRM
CO2	Apply the knowledge in day to day working
CO3	Compare between various options in HRM
CO4	Evaluate the human capital
CO5	Formulate HR policies and procedures

MBA(BA) 301: Modeling Techniques

СО	Description: After the completion of the course student will be able
CO1	Explain data modeling concept, types and applications
CO2	Illustrate different strategies for data per-processing
CO3	Apply learned concepts to build prediction and classification models aims to solve business related problem

CO4	Interpret the outcomes or results of various prediction and classification models
CO5	Choose proper statistical model for a business situation for smooth and fast decision making

MBA(BA) 302: Business Intelligence

СО	Description: After the completion of the course student will be able
CO1	Explain the concepts and components of Business Intelligence (BI)
CO2	Evaluate the technologies that make up BI (data warehousing, OLAP)
CO3	Define how BI will help an organization and whether it will help yours
CO4	Identify the technological architecture that makes up BI systems
CO5	Plan the implementation of a BI system

MBA(BA) 303: Data Science using R [BA-304 AS IN MBA]

со	Description: After the completion of the course student will be able
CO1	Develop basic knowledge of variable and syntax
CO2	Evaluate and Apply appropriate syntax and operation for coding
CO3	Analyze the code segment for applying syntax real life problem
CO4	Analyzing of the code segment for debug the real-life problem
CO5	Evaluate the real-life problem set

MBA(BA) 304: Statistical Quality Control and Six Sigma

СО	Description: After the completion of the course student will be able
CO1	Develop knowledge of the standard SQC methods and develop charting techniques
CO2	Develop knowledge of acceptance sampling principles and methods

СОЗ	Develop six sigma concepts to the overall business mission and objectives
CO4	Identify the organizational factors that can lay the foundation for successful six sigma implementation
CO5	Apply the six sigma skills for a successful process improvement project and deliver effective results for the organization

MBA(BA) 305: Logistics and Supply Chain Analytics

со	Description: After the completion of the course student will be able
CO1	Explain the concept of supply chain analytics
CO2	Develop data-driven rule to manage volatility
CO3	Plan the inventory, flow of goods and services
CO4	Apply various methods of demand forecasting and supply policies
CO5	Analyze various supply chain models

со	Description: After the completion of the course student will be able
CO1	Apply the concept, meaning as well as the importance and different methods of Business Forecasting and the applicability and importance of the each of the methods of Business Forecasting in the Management Decision-Making using previous few years Data of the Organization
CO2	Analyze the existing system, followed by application of strategies, way of operations of the existing Organizational Forecasting System, making improvement with the application or introduction of new and improved Forecasting systems based on the requirement and type of Operation of the organization
CO3	Evaluate and Analyze different aspect of Business Forecasting, viz forecasting of Sales for the coming years, Forecasting of Marketing Budget and return, Forecasting of Labor requirement based on Sales Forecast, Budget requirement based on the Sales Forecast, etc. Evaluation of Business Forecasting methods and Forecasting applications for better performance of actual versus Forecast
CO4	Implement concepts of Business Forecasting at present situation, creating a system for Mathematical modelling, Statistical hypothesis analysis, econometric analysis, Time series analysis of the data of the previous years to model the forecast of the coming years, Linear and non-linear modelling, univariate and multivariate analysis of Organizational data to have a better forecast of the coming years, creation a system in the organization based on R and R studios, Analysis of the historical data using R and Rstudio, coding in R for Business Forecasting to be applied in the organization
CO5	Apply the difference between the types of Forecasting methods using the architecture of Data Analytics, application of Analytics and forecasting, use of application like R. Connecting R studio with Organizational data base to analyze the historical data and make forecast. Analysis of the existing Forecasting tools and upgrading it with updated system for better performance

СО	Description: After the completion of the course student will be able
CO1	Explain basic concepts on big data technology
CO2	Apply the big data technology on given data set
CO3	Apply the big data technology on real life problem
CO4	Apply the big data technology on the appropriate data set
CO5	Analyze the data set using big data technology

MBA(BA) 401: Big Data Technology [BA-402 AS IN MBA]

MBA(BA) 402: Data Modeling

СО	Description: After the completion of the course student will be able
CO1	Explain data modeling and management concepts

CO2	Design and organize various types of data using a relational and non-relational data models
CO3	Analyze the characteristics and requirements of data and select an appropriate data model
CO4	Identify the implementation and perform frequent data operations (CRUD: create, read, update and delete) on relational and SQL databases
CO5	Discuss the concepts and the importance of big data, data security, privacy and governance

MBA(BA) 403: Data Mining [BA-404 AS IN MBA]

CO	Description: After the completion of the course student will be able
CO1	Explain the basic concept of data mining
CO2	Apply the data mining tools on given data set
CO3	Apply data mining algorithm on iris data set
CO4	Apply the classification and clustering on data set

MBA(BA) 404: Predictive Analytics

со	Description: After the completion of the course student will be able
CO1	Determine prediction-related principles, theories and approaches
CO2	Apply systems and critical thinking to analytics problems
CO3	Understand the basics of predictive techniques and statistical approaches
CO4	Apply predictive analytics approaches on diverse business cases and scenarios
CO5	Classify advanced analytics tools and platforms

MBA(BA) 405: Data Analytics using Python [BA-405 AS IN MBA]

СО	Description: After the completion of the course student will be able

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CO1	Explain variables, expressions, statements, conditions and operations, data structures used in Python
CO2	Illustrate the Object-Oriented Programming concepts applicable to Python
CO3	Apply in-built functions to solve various business-related situation for faster decision making
CO4	Distinguish various exception handling modules and outcomes of regular expression
CO5	Build user-defined function to solve various business-related situation for faster decision making

MBA(BA) 406: Optimization Analytics

со	Description: After the completion of the course student will be able
CO1	Explain the fundamental knowledge of Linear Programming and Dynamic Programming problems
CO2	Make use of classical optimization techniques and numerical methods of optimization
CO3	Explain the basics of different evolutionary algorithms

CO4	Determine the fundamentals of Integer programming technique and apply different techniques to solve various optimization problems arising from managerial problem and network analysis
CO5	Analysis the different case studies using optimize techniques

Program Name: M.Sc. in Applied Chemistry

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MSCAC/AllSem21.pdf

Organic Chemistry-I

Paper code: MSAC101

со	Description: After the completion of the course student will be able
CO1	To be able to predict reaction intermediates, stereochemistry of organic compounds.
CO2	To be able to address problems on pericyclic and photochemical reactions.
CO3	To be able to explore the role and applications of oxidising and reducing agents in organic synthesis.
CO4	To impart advanced knowledge regarding various rearrangement reactions for synthetic applications.

Advanced Inorganic Chemistry

Paper code: MSAC102

со	Description: After the completion of the course student will be able
CO1	To effectively learn the fundamentals of the chemistry of the main group elements, and important real world applications of many of these species.
CO2	To learn the key concepts of inorganic chemistry related synthesis, reaction chemistry, structure and bonding.
CO3	To impart advanced knowledge regarding transition metal and inner transition metal chemistry.

Advanced Physical Chemistry

со	Description: After the completion of the course student will be able
CO1	Effectively learn group theory and its use for molecular term symbols.
CO2	Information regarding thermodynamic properties of different systems which may be applied to understand the equilibrium conditions of chemical reactions.
CO3	Will be expertise to predict the reaction rate using computer software.
CO4	Will be able to treat ionic reactions probably.

Analytical Techniques

Paper code: MSAC104

СО	Description: After the completion of the course student will be able
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CO1	Knowledge about spectroscopic techniques and solving structural problems based on UV-Vis, IR, 1H-NMR, 13C-NMR and mass spectral data.
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CO2	Electron microscopy and mass spectroscopy will be learnt.
CO3	To impart knowledge about thermal analysis techniques and associated methods.
CO4	To learn separation techniques and data analysis using contemporary techniques.

Numerical Methods in Computational Chemistry

со	Description: After the completion of the course student will be able
CO1	Will be able to handle linear and nonlinear equations.
CO2	Will be able to solve linear and nonlinear equations.

CO3	Will be able to handle matrices and determinants using computers.
CO4	Will be able to write computer programmes to solve differential equations and integration.
CO5	Will be able to calculate error of experimental results.
CO6	Will be able to use proper methods for any kind of problem solution using numerical methods.

Lab Techniques for quantitative and qualitative analysis

СО	Description: After the completion of the course student will be able
CO1	Characterization and analysis of organic compounds for identifying functional groups can be learnt.
CO2	Synthesis of organic compounds and separation of components in mixtures can be studied, which is of great use in different chemical fields.

CO3	Purification of organic compounds from mixture.

Computer Programming-I

Paper code: MSAC192

со	Description: After the completion of the course student will be able
CO1	Will be able to handle different operating systems of computers.
CO2	Will be able to write a simple FORTRAN programme.
CO3	Will be able to write C/C++ Programme.
CO4	Will be able to write Python programmes.

Computer aided Stereo-chemical Analysis of Complex Chemical Reaction

СО	Description: After the completion of the course student will be able
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CO1	Will be able to draw the structure of organic compounds.
CO2	Will be able to predict R, S nomenclature of an organic compound.

Quantum Chemistry

со	Description: After the completion of the course student will be able
CO1	Will be familiar with different quantum numbers.
CO2	Will be able to calculate the quantum number of an electron in a particular state.
CO3	Will be able to find out the wave function of any chemical system.
CO4	Will be able to relate the spectra of a system with its electronic structure.
CO5	Will be able to learn about the electronic structure of a molecule.

Statistical Mechanics

Paper code: MSAC202

со	Description: After the completion of the course student will be able
CO1	Knowledge on distribution and fluctuations of parameters in different systems can be learnt, which will help in understanding fluctuations in macroscopic observables.
CO2	Knowledge on different thermodynamic properties in various systems can be known which have applications in real systems.
CO3	Fluctuations of observables in different systems can be estimated which have wide applications.
CO4	Properties of electrons in metals can be known and applications in real systems can be done.

Organic Chemistry-II

со	Description: After the completion of the course student will be able
CO1	Knowledge on various metal-catalyzed coupling reactions, reducing agents, oxidizing agents, and their applications in organic synthesis.
CO2	Acquire knowledge on organic spectroscopic techniques and solve problems and structural analysis.
CO3	Learn about synthesis and utility of various heterocyclic compounds.
CO4	Knowledge of basic principles of photochemistry and advanced photochemical reactions.

Nano Science and Technology

со	Description: After the completion of the course student will be able

CO1	Synthesis of nano materials of various elements having different properties can be learnt, which has diverse industrial applications.
CO2	Structure and characterization of Nano materials will be studied for application in drug delivery processes.
CO3	Symmetry in molecules and different properties of nano materials will be known which help in applications in medical fields.

Applications of Artificial Intelligence and Machine Learning in Chemistry

Paper code: MSAC205

СО	Description: After the completion of the course student will be able
CO1	To learn the basics of ML approach and its concepts from problem setting to evaluating the goodness of a model.
CO2	To learn how ML is used in contemporary chemistry and can analyze and evaluate a chemistry related ML article.

Natural Products and Medicinal Chemistry

со	Description: After the completion of the course student will be able
CO1	To learn basics of lead drugs and to describe the biosynthetic studies of different classes of drugs.
CO2	To acquire knowledge on structure and synthesis of amino acids, peptides and nucleic acids.
CO3	To acquire knowledge on concepts of synthetic molecules in medicinal chemistry.

Computational Methods in Chemistry

СО	Description: After the completion of the course student will be able
CO1	Will be able to draw structure and optimize it using DFT.
CO2	Will be able to compute physical and chemical properties of a compound.

CO3	Will be able to plot and analyze data with the help of a computer.

Advanced Chemistry Laboratory

Paper code: MSAC292

со	Description: After the completion of the course student will be able
CO1	Will learn laboratory techniques for organic synthesis and characterization.
CO2	Learn synthetic procedures: aqueous workup, distillation, reflux, separation, isolation, and crystallization.
CO3	Gain knowledge about starting materials, functional groups, mechanisms, and typical reaction conditions.

Bioorganic, Supramolecular and Green Chemistry

со	Description: After the completion of the course student will be able
CO1	To gain knowledge in bonding in supra molecules and their formations will help in understanding supra molecular devices and molecular switches.
CO2	To learn structure and utility of natural and unnatural organic compounds which will help in understanding drug-receptor binding for applications in drug delivery processes.
CO3	To be able to apply green chemistry in chemical reactions and environmentally benign solutions.

Biochemistry and Bioinorganic Chemistry

со	Description: After the completion of the course student will be able
CO1	Different interactions and energy change in cells can be understood. This will help in biochemical applications.

CO2	Different methods of Preparation of organometallic compounds will be known and may be applied to industry.
CO3	Structure and bonding involved in supramolecules can be determined. These molecules are required in industry.
CO4	Transport of different elements and energy within cells can be determined which has applications in the pharmaceutical field.

Research Methodology

со	Description: After the completion of the course student will be able
CO1	To be able to search Literature and define a research problem.
CO2	Capable of designing a research plan and techniques to solve problems.
CO3	Apply different software for computer programming.
CO4	Able to analyze data from experimental work.

Computer Programming-II

Paper code:MSAC391

со	Description: After the completion of the course student will be able
CO1	Will be able to compute electronic structure and properties of a chemical system.
CO2	Will be able to compute dynamical properties of a chemical system.

Preparation of complex materials and their characterization by physiochemical techniques Paper code:MSAC392

СО	Description: After the completion of the course student will be able
CO1	Characterization of molecules can be done for their applications.
CO2	Estimation of the components amount in a mixture.

CO3	Rates of reactions are known for applications.
CO4	Characterization of electrodes are done.

Program Name: MASTER OF TECHNOLOGY IN INDUSTRIAL ENGINEERING AND MANAGEMENT PROGRAM

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MTECHIEM/AllSem21.pdf

Subject Name: Work System Design Subject Code: PC-IEM101

со	Description: After the completion of the course student will be able
CO1	Explain basic productivity concepts and productivity measurement approaches of the Organizations.
CO2	Apply the various methods of Method study to Improve productivity.
CO3	Apply the various techniques of work measurement in manufacturing systems.
CO4	Explain Ergonomic principles for Work Systems.
CO5	Design Work Space, Manual Material Handling Tasks and Physical Work Environment.
CO6	Estimate Physical Work Capacity and Workload of Individuals.

Subject Name: Production Planning and Control Subject Code: PC-IEM102

со	Description: After the completion of the course student will be able
CO1	Explain the requirement of production planning and control for manufacturing organizations.
CO2	Apply the appropriate planning and control techniques to estimate production-distribution system design.
CO3	Analyze, evaluate and make decisions for short term as well as long term organizational growth.
CO4	Predict changes in demand pattern due to external and internal factors and develop operations scheduling and control.
CO5	Design production planning and control operations for any manufacturing industry.

Subject Name: Research Methodology and IPR Subject Code: MC-IEM101

со	Description: After the completion of the course student will be able
CO1	Develop an understanding on different types of research problems, different steps of formulation of research problems according to their roles in real life.
CO2	Generate research questions associated with research problems.
CO3	List various sources of information for literature review and data collection.
CO4	Apply different research techniques and methodologies for implementation so that research problems can be solved.
CO5	Develop an understanding on the role of Intellectual Property Rights (IPR) and its laws which can protect the researchers for promoting new and better products and in turn brings about socioeconomic benefit.

Subject Name: Work System Design Laboratory Subject Code: PC-IEM191

со	Description: After the completion of the course student will be able
CO1	Measure Ergonomic variables for Short and Long Cycle Jobs.
CO2	Measure Work Capacity of Individuals.
CO3	Measure Anthropometric Dimensions.
CO4	Analyze the Work Posture of an individual while working.
CO5	Analyze Human Machine Interface.
CO6	Analyze tasks using Time Study Methods.

Subject Name: Simulation Laboratory Subject Code: PC- IEM192

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со	Description: After the completion of the course student will be able
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CO1	Explain the basic steps involved in the discrete event simulation process by using simulation software.
CO2	Identify and examine the entities involved in a simulation process given in simulation software.
CO3	Decide the activity cycle diagram for each entity by using simulation software.
CO4	Solve simulation experiments using simulation software, estimate the results and perform sensitivity analysis to test the effects of critical model parameters.

Subject Name: Operations Research-I Subject Code: PC-IEM201

со	Description: After the completion of the course student will be able
CO1	Summarize the application of OR and frame a LP Problem with solution – graphical and through solver add in excel (software).
CO2	Explain the relationship between a linear program and its dual, including strong duality and complementary slackness.

CO3	Formulate and solve transportation and assignment problems.
CO4	Define and solve integer linear programming problems.
CO5	Define and demonstrate the dynamic programming technique and its application in decision making.

Subject Name: Quality Design and Control Subject Code: PC-IEM202

со	Description: After the completion of the course student will be able
CO1	Comprehend fundamental knowledge on the basics of quality control and management of quality.
CO2	Apply statistical tools for online process control.
CO3	Design acceptance Sampling (AS) plans.

CO4	Examine reliability of complex mechanical systems.
CO5	Apply factorial design and Taguchi methods for product and process design.

Subject Name: Quality Design and Control Laboratory Subject Code: PC-IEM291

со	Description: After the completion of the course student will be able
CO1	Compute and interpret various parameters and statistics used in statistical quality control.
CO2	Construct and interpret visual data displays, including the stem- and-leaf plot, the histogram, and the box plot.
CO3	Develop control charts for variables and attributes.
CO4	Design acceptance sampling plans for attributes.

CO5	Determine reliability of items connected in series and parallel network.

Subject Name: Design Thinking Laboratory Subject Code: PC-IEM292

СО	Description: After the completion of the course student will be able
CO1	Explain the methods, processes, and key principles of design thinking.
CO2	Develop the capability to empathize with end-users to develop meaningful products or services.
CO3	Define problems and develop a deeper understanding of users and their interactions with the designed environment.
CO4	Participate and conduct ideation sessions with team members for new ideas and solutions.
CO5	Create and present a prototype through solutions achieved.

CO6	Test solutions and work on feedback loops.
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Program Name: BSc. Media Science Programme

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BSCMS1/AllSem21.pdf

Paper Name: Introduction to Media and Mass Communication Paper Code: BMS-101

СО	Description: After the completion of the course student will be able
CO1	Explain the role of communication and its types in daily life.
CO2	Analyze barriers in communication.
CO3	Analyze role of Mass communication in India and Worldwide.
CO4	Explain various models and theories of human communication

Paper Name: Introduction to Photography and Design I Paper Code: BMS-102

со	Description: After the completion of the course student will
	be able

CO1	Analyze the historical perspective of photography.
CO2	Analyze nature & scope of photography.
CO3	Develop framing and composition sense.
CO4	Explain Mechanism of DSLR.
CO5	Develop ideas about depth of field.
CO6	Differentiate between natural light and artificial light.
CO7	Explain contribution of various eminent personalities in the field of photography.

Paper Name: Introduction to Photography and Design I- Practical Paper Code: BMS-191

со	Description: After the completion of the course student will be able
CO1	Develop a sophisticated use of photography-related vocabulary and concepts necessary to engage within a studio environment.
CO2	Demonstrate appropriate techniques in an advanced photographic practice as well as studio habits beyond the classroom studio.
CO3	Demonstrate ability to meet deadlines with proper time management and craftsmanship.
CO4	Prepare portfolios for professional presentation.
CO5	Become familiar with softwares like Adobe Photoshop, Illustrators, Flash.
CO6	Edit photos.
C07	Create Logo & Vector designs

CO8	Do basic animations

Paper Name: English Grammar and Literature Paper Code: BMSAECC 104

со	Description: After the completion of the course student will be able
CO1	Implement accurate voices and tenses for basic communication practices.
CO2	Write formal letters.
CO3	Demonstrate the role of adjectives and grammar in English.
CO4	Write an application for a job.

Paper Name: Introduction to Journalism 1- Print and New Media Paper Code: BMS 201

со	Description: After the completion of the course student will be able
CO1	Write news reports, features and headlines.
CO2	Design the structures of Newspaper, newsletter & magazine.
CO3	Apply the theories of reporting to prepare a new report from inception to publication.
CO4	Analyze and edit reports for publication.
CO5	Develop an understanding of the media from a historical perspective.

Paper Name: Introduction to Journalism 1- Print and New Media- Practical Paper Code: BMS 291

СО	Description: After the completion of the course student will be able
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CO1	Write news reports, features and headlines.
CO2	Design the structures of Newspaper, newsletter & magazine.
CO3	Apply the theories of reporting to prepare a new report from inception to publication.
CO4	Analyze and edit reports for publication.

Paper Name: Introduction to Photography and Design II Paper Code: BMS 202

со	Description: After the completion of the course student will be able
CO1	Analyze the historical perspective of photography.
CO2	Analyze nature & scope of photography.

CO3	Develop framing and composition sense.
CO4	Develop ideas about depth of field.
CO5	Differentiate between natural light and artificial light.
CO6	Explain contribution of various eminent personalities in the field of photography.

Paper Name: Introduction to Photography and Design II- Practical Paper Code: BMS 292

со	Description: After the completion of the course student will be able
CO1	Demonstrate appropriate techniques in an advanced photographic practice as well as studio habits beyond the classroom studio.
CO2	Prepare portfolios for professional presentation.

CO3	Become familiar with softwares like Adobe CC.
CO4	Create Logo & Vector designs.

Paper Name: Overview of world and Indian History Paper Code: BMSAECC204

со	Description: After the completion of the course student will be able
CO1	Apply the concepts in Exploring local history of different media.
CO2	Implement the theories for correlating growth of media to socio economic political factors.
CO3	Interpret the emergence of New Media in comparison to the traditional media platforms.
CO4	Apply the information to document the evolution of media.

Paper Name: Introduction to film studies- In current perspective Paper Code: BMS 301

со	Description: After the completion of the course student will be able
CO1	Analyze historical perspective of world cinema.
CO2	Analyze historical perspective of Indian cinema.
CO3	Explain various genres of cinema.
CO4	Explain the Golden era of Hollywood.
CO5	Analyze history of Italian Neorealism, French New Wave.
CO6	Explain Surrealism.

Paper Name: Introduction to film studies- In current perspective-Practical Paper Code: BMS 391

со	Description: After the completion of the course student will be able
CO1	Develop a sense of the stages of film production.
CO2	Create scripts for non-fiction.
CO3	Learn production management of documentary films.
CO4	Understand techniques of screenplay writing for fiction film.
CO5	Create shooting scripts and storyboards.

Paper Name: Introduction to consumer behaviour, marketing and advertising Paper Code: BMS 302

CO1	Develop Skills of Marketing a product.
CO2	Create brand strategy.
CO3	Analyze strategy to fix the price of a product.
CO4	Explain the role of Advertising.
CO5	Analyze the role of advertising agencies.
CO6	Demonstrate the creative aspects of advertising Copywriting Design & Layout.

Paper Name: Introduction to consumer behaviour, marketing and advertising- Practical Paper Code: BMS 392

со	Description: After the completion of the course student will be able
CO1	Plan a live Event.
CO2	Develop a budget for the event.
CO3	Create strategy for advertising.
CO4	Develop a PR Campaign.

Paper Name: Journalism 2- Electronic Media Paper Name: BMS 303

со	Description: After the completion of the course student will be able
CO1	Analyze history of Electronic Media.

CO2	Explain Broadcasting technology.
CO3	Explain various genres of radio and television program.
CO4	Analyze radio as a mass communication medium.
CO5	Analyze the historical perspective of television.
CO6	Explain news reporting for television programs.
C07	Explain the techniques of contemporary electronic media.

Paper Name: Journalism 2- Electronic Media Practical Paper Code: BMS 393

со	Description: After the completion of the course student will be able

CO1	Familiarizing with the technology of radio and television production.
CO2	Familiarizing with Video cameras.
CO3	Develop Skills of taking different shots.
CO4	Developing expertise in video editing software such as Premiere and FCP.

Paper Name: Current affairs in political and economic perspective Paper Code: BMSSEC305

со	Description: After the completion of the course student will be able
CO1	Apply the concepts in social and political theory in a contemporary perspective.
CO2	Implement the theories for correlating growth of media to socio economic political factors.
CO3	Interpret the economic changes in terms of various social and political factors.
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CO4	Apply the information to document the evolution of media during the era of Globalization.

Paper Name: Film Studies II Paper Code: BMS 401

СО	Description: After the completion of the course student will be able
CO1	Analyze basic aesthetics of cinema.
CO2	Apply semiotic theories into film analysis.
CO3	Explain various genres of cinema.

CO4	Analyze history of Indian cinema.
CO5	Analyze the works of the cinematic auteurs.
CO6	Creating awareness about contemporary media platforms and cinema.

Paper Name: Film Studies II Practical Paper Code: BMS 491

со	Description: After the completion of the course student will be able
CO1	Design audio and visual elements of a film.
CO2	Demonstrate the role of a production team.
CO3	Develop Script & Screenplay for films.

CO4	Creating a story through presentation.
CO5	Create a fiction/non-fiction.

Paper Name: Public Relations, Corporate Communication, and Social Media Management Paper Code: BMS 402

СО	Description: After the completion of the course student will be able
CO1	Analyze the historical perspective of Public Relations.
CO2	Explain models and theories of marketing and advertising.
CO3	Explain the role of In house PR.
CO4	Analyze External communication.
CO5	Analyze Internal communication.

CO6	Handle crisis management.

Paper Name: Public Relations, Corporate Communication, and Social Media Management-Practical

Paper Code: BMS492

со	Description: After the completion of the course student will be able
CO1	Develop social media promotion skills.
CO2	Create Brand Strategy for marketing in social media.
CO3	Develop promotion skills in social media platforms.
CO4	Generating employment opportunities through social media platforms.
CO5	Create a professional profile for marketing.

Paper Name: Digital Media and its Marketing

Paper Code: BMS 403

со	Description: After the completion of the course student will be able
CO1	Analyze emergence of new media.
CO2	Explain basic concepts of the World Wide Web.
CO3	Demonstrate cyber law, copyright & Plagiarism.
CO4	Develop content for the digital media.
CO5	Create ideas of digital marketing.

Paper Name: Digital Media and its Marketing Paper Code: BMS 493

со	Description: After the completion of the course student will
	be able

CO1	Create various layouts.
CO2	Expert in Indesign.
CO3	Create a digital newspaper.
CO4	Develop a basic Webpage.
CO5	Become familiar with Dreamweaver.
CO6	Stylize a basic webpage with CSS.

Paper Name: Personality development and soft skills Paper Code: BMSSEC 405

со	Description: After the completion of the course student will be able
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CO1	Develop skills in professional and inner-personal communications.
CO2	Do time management.
CO3	Develop personality.
CO4	Gain positive thinking in life.
CO5	Add humor in communication.
CO6	Maintain ethics and Etiquette.

Paper Name: Media Management and Entrepreneurship Paper Code: BMS 501

CO1	Develop Skills of Marketing a product.
CO2	Create brand strategy.
CO3	Analyze strategy to fix the price of a product.
CO4	Explain the role of Advertising.
CO5	Analyze the role of advertising agencies.

Paper Name: Media Management and Entrepreneurship Practical Paper Code: BMS 591

со	Description: After the completion of the course student will be able
CO1	Do social media promotion with Facebook.
CO2	Create Brand Strategy for marketing on Facebook.

CO3	Do social media promotion with Twitter, Instagram, Youtube.
CO4	Earn revenues from social media platforms.
CO5	Develop a business account on pinterest.
CO6	Create a professional profile in LinkedIn for marketing.

Paper Name: Communication Research and Data Analysis Paper Code: BMS 502

со	Description: After the completion of the course student will be able
CO1	Use concepts for both market and academic research.
CO2	Perform analysis of content, DATA and materials available for a topic.

CO3	Prepare questionnaires for surveys.
CO4	Write inferences, executive summaries based on research on a particular topic.

Paper Name: Communication Research and Data Analysis-Practical Paper Code: BMS 592

со	Description: After the completion of the course student will be able
CO1	Use concepts for both market and academic research.
CO2	Perform analysis of content, DATA and materials available for a topic.
CO3	Prepare questionnaires for surveys.
CO4	Write inferences, executive summaries based on research on a particular topic.

Paper Name: Environment and Development Communication Paper Code: BMS 601

со	Description: After the completion of the course student will be able
CO1	Analyze the scope and importance of communication for the environment.
CO2	Explain various case studies on various resources of India.
CO3	Explain structure & concept of ecosystem.
CO4	Explain the importance of biodiversity.
CO5	Demonstrate the methods of biodiversity conservation.
CO6	Analyze the cause of Environment pollution.
CO7	Explain sustainable development.

Paper Name: Environment and Development Communication-Practical Paper Code: BMS 691

со	Description: After the completion of the course student will be able
CO1	Analyze the scope and importance of communication for the environment.
CO2	Explain various case studies on various resources of India.
CO3	Explain structure & concept of ecosystem.
CO4	Explain the importance of biodiversity.
CO5	Demonstrate the methods of biodiversity conservation.
CO6	Analyze the cause of Environment pollution.
C07	Explain sustainable development.

Paper Name: New Media Products and related software programs Paper Code: BMS 602

со	Description: After the completion of the course student will be able
CO1	Analyze emergence of new media.
CO2	Explain basic concepts of the World Wide Web.
CO3	Demonstrate cyber law, copyright & Plagiarism.
CO4	Write for the digital media.
CO5	Write blogs.
CO6	Explain Cyber Journalism and its scopes.

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Paper Name: New Media Products and related software programs Paper Code: BMS 692

СО	Description: After the completion of the course student will be able
CO1	Analyze emergence of new media.
CO2	Explain basic concepts of the World Wide Web.
CO3	Demonstrate cyber law, copyright & Plagiarism.
CO4	Write for the digital media.
CO5	Write blogs.
CO6	Explain Cyber Journalism and its scopes.

Program Name: M. Sc. Media Science Programme

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MSCMS/AllSem20.pdf

Paper Name: Mass Media and Communication Paper Code: MMC 101

со	Description: After the completion of the course student will be able
CO1	Apply the fundamental concepts and features of COMMUNICATION in the media industry.
CO2	Apply the THEORIES OF COMMUNICATION for media projects.
CO3	Interpret the market trend in the media industry using key concepts of Communication.
CO4	Apply communication techniques for multimedia platforms.

Paper Name: Understanding Media in Historical Perspective Paper Code: MMC 102

СО	Description: After the completion of the course student will be able
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CO1	Apply the concepts in Exploring local history of different media.
CO2	Implement the theories for correlating growth of media to socio economic political factors.
CO3	Interpret the emergence of New Media in comparison to the traditional media platforms.
CO4	Apply the information to document the evolution of media.

Paper Name: Introduction to Journalism Paper Code: MMC 103

со	Description: After the completion of the course student will be able
CO1	Write news reports, features and headlines.
CO2	Design the structures of Newspaper, newsletter & magazine.

CO3	Apply the theories of reporting to prepare a new report from inception to publication.
CO4	Analyze and edit reports for publication.

Paper Name: Indian Constitution, Media Laws & Ethics Paper Code: MMC 104

со	Description: After the completion of the course student will be able
CO1	Apply knowledge of Press Laws while reporting.
CO2	Identify the lapses of law while reporting.
CO3	Identify crimes in Cyberspace.
CO4	Prepare contemporary case studies based on press freedom.

Paper Name: Introduction to Advertising and Public Relations Paper Code: MMC 105

со	Description: After the completion of the course student will be able
CO1	Apply the basic concepts of public relation skills to enhance growth of a project.
CO2	Design a publicity campaign.
CO3	Start and supervise an advertising agency.
CO4	Prepare a House Journal.

Paper Name: Introduction to Visual Language: Photography & Videography Paper Code: MMC 106

со	Description: After the completion of the course student will be able
CO1	Apply photography skills to prepare engaging reports.

CO2	Editing photos and videos using digital technology.
CO3	Make short films using concepts of videography.
CO4	Use filmmaking concepts to shoot an ad campaign.

Paper Name: Still Photography & Videography Lab Paper Code: MMC 191

со	Description: After the completion of the course student will be able
CO1	Apply photography skills to prepare engaging reports.
CO2	Editing photos and videos using digital technology.
CO3	Make short films using concepts of videography.
CO4	Use filmmaking concepts to shoot an ad campaign.

Paper Name: Lifestyle Management Skills: Advanced Soft Skills, Theatre Workshops Paper Code: MMC 192

со	Description: After the completion of the course student will be able
CO1	Apply skills to conduct interviews and group discussions.
CO2	Apply concepts to prepare PPT and visual presentations for projects.
CO3	Write business related mails, business letters.
CO4	Build networks and organize teams for future projects.

Paper Name: Basic Media Software (Lab) Paper Code: MMC 193

со	Description: After the completion of the course student will
	be able

CO1	Use Photoshop for photo editing.
CO2	Use Corel Draw for graphics design.

Paper Name: Development & Environmental Communications Paper Code: MMC 201

со	Description: After the completion of the course student will be able
CO1	Analyze development and apply the concept of sustainable development.
CO2	Implement communication tools in environmental development.
CO3	Identify environmental issues to mitigate the same.
CO4	Identify the role and significance of media in environmental studies.

Paper Name: Folk, Traditional and Popular Media Paper Code: MMC 202

СО	Description: After the completion of the course student will be able
CO1	Demonstrate the use and the structure of folk tales in media.
CO2	Apply fundamental concepts of different traditional folk media.
CO3	Differentiate popular media and mass media.
CO4	Implement the concepts of folk and traditional media in print, radio, television, cinema and new media.

Paper Name: Film Theory & Practice Paper Code: MMC 203

со	Description: After the completion of the course student will be able
CO1	Implement the practice of film theory in cinema production.

CO2	Differentiate between cinema & theater; cinema & music; cinema & literature.
CO3	Demonstrate the application of visualization strategies in film making.
CO4	Apply the fundamental concepts script writing and storyboard writing in film production.
CO5	Develop the concepts of dialogue writing and film editing.

Paper Name: Applications of Information Technology to Media Paper Code: MMC 204

со	Description: After the completion of the course student will be able
CO1	Apply computer aided multimedia systems.
CO2	Demonstrate the role and importance of data transmission, network topologies.

CO3	Be acquainted with the different data storages and transmission systems used in modern information technology.
CO4	Demonstrate various compressed and uncompressed file formats.

Paper Name: New Media & Cyber Technology Paper Code: MMC 205

со	Description: After the completion of the course student will be able
CO1	Apply different attributes of the world wide web.
CO2	Analyze and apply security and surveillance systems.
CO3	Apply fundamental concepts of social networking.
CO4	Be acquainted with the role of hacking, ethics and emerging cultural trends.

Paper Name: Writing, Editing Practicals Paper Code: MMC 291

со	Description: After the completion of the course student will be able
CO1	Implement fundamentals on Quarkxpress.
CO2	Apply the fundamental concepts of news gathering, reporting, editing and photography in newsletter publishing.
CO3	Demonstrate the role and importance of page layout and printing.
CO4	Analyze the role of distribution and publishing of a newsletter.

Paper Name: Advanced Multimedia Software Lab Paper Code: MMC 292

СО	Description: After the completion of the course student will be able
CO1	Use Flash & after Effects.

CO2	Use Final Cut Pro & Adobe Premiere.
CO3	Enhance skills of HTML & Dream Weaver & Notepad ++

Paper Name: Digital Filmmaking Lab Paper Code: MMC 293

со	Description: After the completion of the course student will be able
CO1	Handle camera.
CO2	Record sound.
CO3	Enhance the skill of editing.
CO4	Shoot and edit film.

Program Name: B.Sc. in Gaming and Mobile Application Development

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BSCGMAD/AllSem21.pdf

Paper Name: Introduction To Computer Fundamentals Paper Code: BGMAD-101

СО	Description: After the completion of the course student will be able
CO1	Analyze the historical perspective of computers.
CO2	Classify different types of computer.
CO3	Explain the principles of computer fundamentals.
CO4	Develop basic knowledge of computers.
CO5	Develop computer hardware and software knowledge.
CO6	Analyze different applications of computers.
CO7	Explain methods of creating various documents and media files.

CO8	Analyze the overall architecture of a computer system.
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Paper Name: Drawing Paper Code: BGMAD-102

со	Description: After the completion of the course student will be able
CO1	Analyze the role and contribution of drawing.
CO2	Analyze the history and development of visual art .
CO3	Analyze the political, cultural and aesthetic nuances of drawing.
CO4	Analyze the history and development of art and culture.
CO5	Demonstrate the stages of drawing.

Paper Name: Computer Software Lab Paper Code: BGMAD-191

CO	Description: After the completion of the course student will be able
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CO1	Description of Computer Software.
CO2	Developing concepts with respect to various hardware components.
CO3	Build the concept of office automation.
CO4	Demonstrate layouts of software.

Paper Name: Digital Drawing LAB Paper Code: BGMAD-192

СО	Description: After the completion of the course student will be able
CO1	Develop a digital drawing concept .
CO2	Implementation of real word experience in digital drawing.

Paper Name: Communicative English I Paper Code: BGMADAECC-101

со	Description: After the completion of the course student will be able
CO1	Implement accurate voices and tenses for basic communication practices.
CO2	Write formal letters.
CO3	Demonstrate the role of adjectives and grammar in English.
CO4	Write an application for a job.

Paper Name: Introduction to Object Oriented Programming and Data Structures Paper Code: BGMAD-201

со	Description: After the completion of the course student will be able
CO1	Analyze object oriented programming.

CO2	Demonstrate the role of elements and principles of data structure.
CO3	Demonstrate the object oriented walkthrough with data structures.

Paper Name: Introduction to Operating System Paper Code: BGMAD-202

СО	Description: After the completion of the course student will be able
CO1	Analyze the role of operating systems in computers.
CO2	Demonstrate the role of process.

Paper Name: C# Programming Lab Paper Code: BGMAD-291

со	Description: After the completion of the course student will be able
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CO1	Develop the skills of object oriented concept in c#.
CO2	Become familiar with C# object oriented programming.
CO3	Develop designs for development of software applications.

Paper Name: OS Lab Paper Code: BGMAD-292

СО	Description: After the completion of the course student will be able
CO1	Become familiar with OS.
CO2	Implement Process lifecycle management.

Paper Name: Environmental Science Paper Code: BGMADAECC-201

со	Description: After the completion of the course student will be able
CO1	Analyze the issue of environmental, ecosystem & biodiversity.
CO2	Solve problems of environmental pollution by mere laws.
CO3	Analyze usage of natural resources.

CO4	Analyze social & environmental issues.
CO5	Correlate the issues of human population & environment.

Paper Name: Game Idea: Visualization & Storytelling Paper Code: BGMAD-301

со	Description: After the completion of the course student will be able
CO1	Analyze the role of research in visual communication.
CO2	Develop the skill of writing storyline.
CO3	Analyze the production planning & budgeting details.
CO4	Develop the idea of script composition.

Paper Name: Introduction to 2D game design Paper Code: BGMAD-302

со	Description: After the completion of the course student will be able
CO1	Develop the skill of 2D games.
CO2	Develop the skills of 2D animation games.

Paper Name: 3D Modeling & Texturing for gaming Paper Code: BGMAD-303

со	Description: After the completion of the course student will be able
CO1	Apply the fundamental concepts of dimensions and axes.
CO2	Analyze the difference between 2D & 3D.
CO3	Analyze the historical perspective of 3D animation.
CO4	Explain the role of different industries of 3D animation.
CO5	Become familiar with Autodesk Maya and Tools.
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CO6	Explain basic modeling techniques.
C07	Explain the role of texturing in 3D animation.

Paper Name: Game storyboard Lab Paper Code: BGMAD-391

со	Description: After the completion of the course student will be able
CO1	Develop the skills of writing screenplay in respect to framing a shot.
CO2	Analyze the role of storyboard in filmmaking.
CO3	Implement the idea of storytelling through screenplay.
CO4	Draw a detailed storyboard for the film.

Paper Name: 2D Game design with Unity Lab Paper Code: BGMAD-392

со	Description: After the completion of the course student will be able
CO1	Design a 2D Set.
CO2	Develop the skill of Unity.
CO3	Design costumes according to the script requirement.

Paper Name: Computer System architecture & amp; Network Lab Paper Code: BGMAD 393

со	Description: After the completion of the course student will be able

CO1	Apply the fundamental concepts of computer architecture.
CO2	Analyze the difference between mobile and computer architecture.
CO3	Analyze the basic adaptive knowledge of computer networks.
CO4	Explain the role of different modules of the computer network.
CO5	Become familiar with mobile network Tools.
CO6	Explain basic network configuration techniques.
C07	Explain the role of network troubleshooting.

Paper Name: Soft Skill Development Paper Code: BGMADSEC-301

СО	Description: After the completion of the course student will be able
CO1	Develop skills of Problem solving.
CO2	Develop skills of face to face communication.
CO3	Write formal letters such as business communication.
CO4	Develop skills of communication with peers.

Paper Name: Introduction to Game physics, Lighting and Rendering Paper Code: BGMAD-401

со	Description: After the completion of the course student will be able
CO1	Implement game physics.

CO2	Develop skills in lighting.
CO3	Develop skills in rendering.

Paper Name: Introduction to Character Designing Paper Code: BGMAD-402

со	Description: After the completion of the course student will be able
CO1	Explain the role of rigging in 3D animation.
CO2	Explain the role of IK and Fk in Rigging.
CO3	Analyze the Rigging workflow.
CO4	Explain the role of deformers in 3D animation.
CO5	Explain the role of constraints in 3D animation.

CO6	Explain the role of keyframe, graph editor & timeline in 3D animation.
C07	Create a Dope sheet.
CO8	Analyze the importance of Ghosting in animation.

Paper Name: 3D Game Design Techniques Paper Code: BGMAD-403

со	Description: After the completion of the course student will be able
CO1	Develop skills of Game Techniques.
CO2	Classify the 2D and 3D design techniques.
CO3	3D Game design techniques.

Paper Name: Game Physics and Rendering Lab Paper Code: BGMAD-491

со	Description: After the completion of the course student will be able
CO1	Game physics understanding.
CO2	Understanding rendering.

Paper Name: 3D Character Designing Lab Paper Code: BGMAD-492

со	Description: After the completion of the course student will be able
CO1	Rig an organic character in Maya.
CO2	Create blendshape required for facial expression in Maya.
CO3	Develop a complete organic character with all possible rig movements in Maya.
CO4	Animate an organic character performing different actions in Maya.

Paper Name: 3D Game design with Unity Lab Paper Code: BGMAD-493

со	Description: After the completion of the course student will be able
CO1	Develop the skill of 3D gedisn.
CO2	Develop the skill of Unity studio.

Paper Name: Personality Development Paper Code: BGMADSEC-401

со	Description: After the completion of the course student will be able
CO1	Develop skills in professional and inner-personal communications.
CO2	Do time management.

CO3	Develop personality.
CO4	Gain positive thinking in life.
CO5	Add humor in communication.
CO6	Maintain ethics and Etiquette.

Paper Name: Mobile Application Development Paper Code: BGMAD-501

со	Description: After the completion of the course student will be able
CO1	Analyze the mobile application.
CO2	Explain Different types of mobile applications.
CO3	Explain the app life cycle.

CO4	Implementing the mobile application.
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Paper Name: Computer & Mobile architecture with Networking Paper Code: BGMAD-502

со	Description: After the completion of the course student will be able
CO1	Analyze the architecture of computers.
CO2	Analyze the concept of mobile architecture.
CO3	Analyze the concept of networking.

Paper Name: Mobile Application Lab-I Paper Code: BGMAD-591

со	Description: After the completion of the course student will be able
CO1	Development of Mobile application development.

CO2	Development of Mobile applications with networking.
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Paper Name: Computer & Mobile architecture Lab Paper Code: BGMAD-592

со	Description: After the completion of the course student will be able
CO1	Developing the skill of computer architecture.
CO2	Developing the skill of mobile architecture.
CO3	Networking concept.

Paper Name: VFX & SFX for Games Paper Code: BGMAD-601

со	Description: After the completion of the course student will be able
CO1	Skill of VFX & SFX in Game.

Paper Name: Optimization technique for computer games Paper Code: BGMAD-602

со	Description: After the completion of the course student will be able
CO1	Analyze the concept of Optimization techniques.

Paper Name: VFX & SFX Lab Paper Code: BGMAD-691

СО	Description: After the completion of the course student will be able
CO1	Implementation concept of VFX and SFX.

Paper Name: Game OPtimization Lab Paper Code: BGMAD-692

со	Description: After the completion of the course student will
	be able

Program Name: B.Sc. in Animation, Film Making, Graphics & VFX

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BSCAFM/AllSem20.pdf

Paper Name: Introduction to Basic Animation Paper Code: BAFGV-101

со	Description: After the completion of the course student will be able
CO1	Analyze the historical perspective of animation.
CO2	Classify different types of animations.
CO3	Explain the principles of making animation films.
CO4	Develop scripts & screenplay for animation films.
CO5	Develop storyboard & other pre production skills.

CO6	Analyze set & character Design both in 2D and 3D.
CO7	Explain methods of creating musical score, sound effects & Dubbing.
CO8	Analyze post production work such as Editing & Compositing (Chroma keying, Rotoscopy, Vfx).

Paper Name: Introduction to Film Making Paper Code: BAFGV-102

со	Description: After the completion of the course student will be able
CO1	Analyze the role and contribution of eminent personalities of the world in Cinema.
CO2	Analyze the history and development of world cinema.
CO3	Analyze the political, cultural and aesthetic nuances of filmmaking.
CO4	Analyze the history and development of Indian cinema.

CO5 Demonstrate the stages of filmmaking.	
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Paper Name: Traditional Animation Lab Paper Code: BAFGV-191

со	Description: After the completion of the course student will be able
CO1	Draw with basic shapes.
CO2	Draw in respect with various perspectives and eye views.
CO3	Draw human and animal anatomy.
CO4	Demonstrate figures with the help of line of action.
CO5	Analyze live model study.
CO6	Draw stylized characters for animation.

C07	Develop a flipbook animation.

Paper Name: Story & Script Writing Paper Code: BAFGV-192

СО	Description: After the completion of the course student will be able
CO1	Develop a story from scratch for filmmaking.
CO2	Develop the skill of writing synopsis for a film.
CO3	Demonstrate the process of treatment for a film.
CO4	Develop a script for a film.

Paper Name: Communicative English I Paper Code: BAFGV-104

со	Description: After the completion of the course student will be able
CO1	Implement accurate voices and tenses for basic communication practices.
CO2	Write formal letters.
CO3	Demonstrate the role of adjectives and grammar in English.
CO4	Write an application for a job.

Paper Name: Introduction to Graphic Design & Visual Art Paper Code: BAFGV-201

со	Description: After the completion of the course student will be able
CO1	Analyze the historical perspective of design.
CO2	Demonstrate the role of elements and principles of design.

CO3	Demonstrate the role of typography in design.
CO4	Implement graphic shapes in making a layout.
CO5	Develop a layout maintaining all of its principles.

Paper Name: Introduction to 2D Animation Paper Code: BAFGV-202

со	Description: After the completion of the course student will be able
CO1	Analyze the role of 2d animation pipeline in an animation film.
CO2	Demonstrate the role of principles of animation in respect of making a 2D animation film.
CO3	Demonstrate the role of tweening in 2d animation.
CO4	Analyze the difference between straight ahead and keyframe animation.

CO5 Demo	onstrate the role of looping in 2d animation.
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Paper Name: Digital Design, Info Graphics & Branding Paper Code: BAFGV-291

со	Description: After the completion of the course student will be able
CO1	Develop the skills of Illustrations with the help of Adobe Illustrator.
CO2	Become familiar with Adobe Photoshop in image making and manipulation.
CO3	Develop designs for creating brand identity.
CO4	Develop infographics.

Paper Name: 2D animation lab Paper Code: BAFGV-292

со	Description: After the completion of the course student will be able
CO1	Become familiar with Adobe flash.
CO2	Implement tweening for animation and symbols in Flash.
CO3	Develop the skills of character designing in flash.
CO4	Animate in Flash maintaining all the twelve principles.

Paper Name: Environmental Science Paper Code: BAFGV204

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СО	Description: After the completion of the course student will be able
CO1	Analyze the issue of environmental, ecosystem & biodiversity.
CO2	Solve problems of environmental pollution by mere laws.

CO3	Analyze usage of natural resources.
CO4	Analyze social & environmental issues.
CO5	Correlate the issues of human population & environment.
Paper Name: Film Pro	e Production & Production Techniques

Paper Name: Film Pre Production & Production Techniques Paper Code: BAFGV301

со	Description: After the completion of the course student will be able
CO1	Analyze the role of research in film making.
CO2	Develop the skill of writing scripts & screenplay for a film.
CO3	Analyze the production planning & budgeting details.
CO4	Develop the idea of framing a composition.

CO5	Analyze the role of audio production in film making.
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Paper Name: Art Direction for Film Making Paper Code: BAFGV302

со	Description: After the completion of the course student will be able
CO1	Develop the skill of drawing mood boards for a shoot.
CO2	Develop the skill of budgeting and list for shoot.
CO3	Develop the skill of designing a set for a shoot.
CO4	Implement various techniques while designing for a shoot.

Paper Name: Introduction to 3D Animation (Modeling & Texturing) Paper Code: BAFGV303

со	Description: After the completion of the course student will be able
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CO1	Apply the fundamental concepts of dimensions and axes.
CO2	Analyze the difference between 2D & 3D.
CO3	Analyze the historical perspective of 3D animation.
CO4	Explain the role of different industries of 3D animation.
CO5	Become familiar with Autodesk Maya and Tools.
CO6	Explain basic modeling techniques.
C07	Explain the role of texturing in 3D animation.

Paper Name: Screenplay Writing & Storyboard Analysis Paper Code: BAFGV391

со	Description: After the completion of the course student will be able

CO1	Develop the skills of writing screenplay in respect to framing a shot.
CO2	Analyze the role of storyboard in filmmaking.
CO3	Implement the idea of storytelling through screenplay.
CO4	Draw a detailed storyboard for the film.

Paper Name: Set Design, Costume, Makeup Paper Code: BAFGV392

СО	Description: After the completion of the course student will be able
CO1	Design a live set for shooting.
CO2	Develop the skill of live make up.
CO3	Design costumes according to the script requirement.

Paper Name: 3D Modeling & Texturing

Paper Code: BAFGV393

со	Description: After the completion of the course student will be able
CO1	Model hard surface in Maya.
CO2	Model a Set in Maya.
CO3	Model organic characters in Maya.
CO4	Unwrap Uv of 3D models.
CO5	Texture the models which are required for 3D animation.

Paper Name: Soft Skill Development Paper Code: BAFGV305

со	Description: After the completion of the course student will
	be able

CO1	Develop skills of Problem solving.
CO2	Develop skills of face to face communication.
CO3	Write formal letters such as business communication.
CO4	Develop skills of communication with peers.

Paper Name: Cinematography Techniques Paper Code: BAFGV401

со	Description: After the completion of the course student will be able
CO1	Implement cameras as a tool in film making.
CO2	Develop skills to light a film set.
CO3	Develop skills to set up a shot.

CO4	Implement different stages of film production as a cinematographer.
CO5	Demonstrate the role of a cinematographer in film making.

Paper Name: 3D Rigging & Animation Paper Code: BAFGV402

со	Description: After the completion of the course student will be able
CO1	Explain the role of rigging in 3D animation.
CO2	Explain the role of IK and Fk in Rigging.
CO3	Analyze the Rigging workflow.
CO4	Explain the role of deformers in 3D animation.

CO5	Explain the role of constraints in 3D animation.
CO6	Explain the role of keyframe, graph editor & timeline in 3D animation.

Paper Name: Acting & Direction for Film Making Paper Code: BAFGV403

со	Description: After the completion of the course student will be able
CO1	Develop skills of acting with analysis.
CO2	Classify film and stage acting.
CO3	Act with direction.
CO4	Explain different genres of acting.
CO5	Demonstrate the role of direction in film making.

CO6	Direct in different stages of production.
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Paper Name: Camera Handling & Light Set up Paper Code: BAFGV491

со	Description: After the completion of the course student will be able
CO1	Handle camera.
CO2	Supervise camera movements.
CO3	Light a Set in real life movies.
CO4	Develop the skills of natural and artificial lighting for film production.

Paper Name: Rigging, Blendshape & Animation Paper Code: BAFGV492

со	Description: After the completion of the course student will be able
CO1	Rig an organic character in Maya.
CO2	Create blendshape required for facial expression in Maya.
CO3	Develop a complete organic character with all possible rig movements in Maya.
CO4	Animate an organic character performing different actions in Maya.

Paper Name: Acting For Film Paper Code: BAFGV493

со	Description: After the completion of the course student will be able
CO1	Develop the skill of movement and gestures for film.
CO2	Develop the skill of expression and voice modulation for film.

CO3	Develop the skill of pitch delivery for film.
CO4	Develop a short film.

Paper Name: Personality Development Paper Code: BAFGV405

со	Description: After the completion of the course student will be able
CO1	Develop skills in professional and inner-personal communications.
CO2	Do time management.
CO3	Develop personality.
CO4	Gain positive thinking in life.
CO5	Add humor in communication.

CO6	Maintain ethics and Etiquette.

Paper Name: 3D Lighting & Rendering Paper Code: BAFGV501

со	Description: After the completion of the course student will be able
CO1	Analyze the role of CG light for animation.
CO2	Explain Different types of Lighting Techniques in Maya.
CO3	Explain the CG light workflow in 3D animation.
CO4	Explain the role of rendering in 3D animation.
CO5	Explain different types of Render engines and their uses.
CO6	Explain the rendering workflow in 3D animation.

Paper Name: Post Production & Workflow Paper Code: BAFGV502

со	Description: After the completion of the course student will be able
CO1	Analyze the Post production process in filmmaking.
CO2	Demonstrate the role of eminent personalities in film editing.
CO3	Analyze the role of dubbing in film making.
CO4	Explain the role of sound effects in film.
CO5	Explain the role of compositing in film making.

Paper Name: CG Lighting & Rendering Paper Code: BAFGV591

со	Description: After the completion of the course student will be able
CO1	Light a CG set in Maya.
CO2	Render a CG Set with Character with Mental Ray set in Maya.
CO3	Use VRAY for rendering sets in Maya.
CO4	Develop a complete rendered scene with Arnold in Maya.

Paper Name: Editing & Sound Dubbing Paper Code: BAFGV592

со	Description: After the completion of the course student will be able
CO1	Implement the use of transitions and insertion of audio in video.
CO2	Demonstrate the practical role of Montage in film making.

CO3	Edit in Premiere, FCP.
CO4	Become familiar with Sound Forge, Adobe Audition.
CO5	Develop soundtracks for dubbing.

Paper Name: Analysis of 2D & 3D Animation Film Making Paper Code: BAFGV601

СО	Description: After the completion of the course student will be able
CO1	Explain the difference between Preproduction of 2d & 3D animation.
CO2	Explain the difference between production of 2d & 3D animation.
CO3	Explain the difference between post production of 2d & 3D animation.

CO4	Demonstrate the workflow of the pipeline.
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Paper Name: Vfx & Compositing Paper Code: BAFGV602

со	Description: After the completion of the course student will be able
CO1	Analyze the history of compositing.
CO2	Become familiar with the toolbar.
CO3	Explain Compositing with live action.
CO4	Demonstrate Multipass rendering.
CO5	Explain the use of fluid effects, cloth and fur in compositing.
CO6	Explain the use of rotoscopy and green screen in compositing.
CO7	Develop skills of adding vfx into a shot.
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CO8	Explain the role of dynamic effects in compositing.

Paper Name: Creating a 3D Animation short film Paper Code: BAFGV691

со	Description: After the completion of the course student will be able
CO1	Implement practical application of the theories in animation film making.
CO2	Develop an animation movie.

Paper Name: Vfx & Compositing Paper Code: BAFGV692

СО	Description: After the completion of the course student will be able
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CO1	Become Familiar with softwares like After effects, Nuke, Fusion.
CO2	Implement green screen removal with a separate background.
CO3	Implement 2d & 3D tracking.
CO4	Implement skills of rotoscopy.
CO5	Do Color Correction.
CO6	Develop Visual effects.
CO7	Do simulation and wrinkle effect.
CO8	Developing a film intro with vfx.

Program Name: MASTER OF TECHNOLOGY in RENEWABLE ENERGY

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MTECHRE/AllSem22.pdf

Paper Name: Energy and Power System Technology Paper Code: PC-MRE 101

СО	Description: After the completion of the course student will be able
CO1	Relate the energy needs of modern society through viable engineering solutions. (BL1)
CO2	Design economically viable and cutting-edge technology for industrial power solutions. (BL6)
CO3	Explain properties of different types of fuels. (BL4)
CO4	Outline the different components of a thermal power plant. (BL2)
CO5	Use different types of electrical motors and generators according to the need. (BL3)

Paper Name: Renewable Energy I Paper Code: PC-MRE 102

со	Description: After the completion of the course student will be able
CO1	Identify the types of Geothermal and Biomass energy, its surplus availability and critical characteristics. (BL4)
CO2	Prioritize technologies available for conversion of geothermal and biomass energy and its economic implications. (BL5)
CO3	Describe the process used in harnessing and implementation of wind energy. (BL1)
CO4	Categorize hydraulic turbines in generating hydropower. (BL4)

Paper Name: Research Methodology and Intellectual Property Rights Paper Code: MC-MRE 105

со	Description: After the completion of the course student will
	be able

CO1	Outline research problem formulation (BL2)
CO2	Find research related information (BL1)
CO3	Describe research ethics (BL1)
CO4	Create research team of high values (BL6)
CO5	Use different methods of research evaluation (BL3)

Paper Name: Value Education Paper Code: AC-MRE106/I

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СО	Description: After the completion of the course student will be able
CO1	Gather knowledge on self-development.
CO2	Learn the importance of Human ethics.

CO3	Develop the overall personality towards a good human being.

Paper Name: Stress Management by Yoga Paper Code: AC-MRE106/II

со	Description: After the completion of the course student will be able
CO1	Develop a healthy mind in a healthy body leading to the improvement of social health.
CO2	Improve work efficiency and analysis power.

Paper Name: Constitution of India Paper Code: AC-MRE106/III

со	Description: After the completion of the course student will be able
CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
CO4	Discuss the passage of the Hindu Code Bill of 1956.

Paper Name: Pedagogy Studies Paper Code: AC-MRE106/IV

со	Description: After the completion of the course student will be able
CO1	Explain the overall concept of Pedagogy.
CO2	Analyze different components of curriculum and their implementation.

CO3	Explain Outcome Based Education and its implementation.
CO4	Explain the role of Technology in Pedagogy and its implementation.

Paper Name: Energy and Power System Technology Laboratory Paper Code: PC-MRE 191

со	Description: After the completion of the course student will be able
CO1	Explain practical knowledge about various power system components. (BL2)
CO2	Use various testing procedures used in power systems. (BL3)
CO3	Prioritize technologies on energy system instrumentations and control devices. (BL5)
CO4	Justify the properties of different types of fuels. (BL5)

CO5 Fin	d different important parameters of fuels. (BL1)
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Paper Name: Renewable Energy Lab I Paper Code: PC-MRE 192

со	Description: After the completion of the course student will be able
CO1	Relate first-hand knowledge regarding wind power generation. (BL1)
CO2	Explain the working principle of hybrid renewable energy systems. (BL2)
CO3	Outline the process of biodiesel production. (BL2)
CO4	Design hybrid renewable energy systems. (BL6)

Paper Name: Renewable Energy II Paper Code: PC-MRE 201

со	Description: After the completion of the course student will be able
CO1	Illustrate the concepts of different solar cells modules and its uses. (BL3)
CO2	Describe the working principle of the solar cell. (BL1)
CO3	Design grid connected and standalone solar systems. (BL6)
CO4	Explain the knowledge of different solar thermal applications. (BL2)
CO5	Find the site-specific solar radiation profile and solar geometry related data. (BL1)

Paper Name: Renewable Energy III Paper Code: PC-MRE 202

со	Description: After the completion of the course student will
	be able

CO1	Illustrate hydrogen production technologies with and without CO2 production as a by-product. (BL3)
CO2	Outline hydrogen storage and distribution technologies. (BL2)
CO3	Explain basic electrochemical principles of the hydrogen fuel cells, basic fuel cell design concepts, fuel cell systems concepts. (BL2)
CO4	Plan how fuel cells are used for everyday purposes: road, water and air transport vehicles, portable and stationary use. (BL6)
CO5	Categorize different types of ocean and tidal resources. (BL4)

Paper Name: English for Research Paper Writing Paper Code: AC-MRE205/I

со	Description: After the completion of the course student will be able
CO1	Understand how to improve your writing skills and level of readability.

CO2	Learn about what to write in each section.
CO3	Understand the skills needed when writing a Title.
CO4	Construct the good quality of paper at very first-time submission.

Paper Name: Disaster Management Paper Code: AC-MRE205/II

со	Description: After the completion of the course student will be able
CO1	Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO2	Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO3	Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

CO4	Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in
	different countries, particularly their home country or the countries they work in.

Paper Name: Statistics & Probability with R Paper Code: AC-MRE205/III

СО	Description: After the completion of the course student will be able
CO1	Demonstrate the language and core concepts of probability theory.
CO2	Apply basic principles of statistical inference.
CO3	Make use of programming language R to do statistics.
CO4	Apply, examine, and conclude statistical information.

Paper Name: Personality Development through Life Enlightenment Skills Paper Code: AC-MRE205/IV

со	Description: After the completion of the course student will be able
CO1	Develop his personality and achieve the highest goal in life.
CO2	Lead the nation and mankind to peace and prosperity.
CO3	Help in developing the versatile personality of students.

Paper Name: Renewable Energy Lab II Paper Code: PC-MRE 291

со	Description: After the completion of the course student will be able
CO1	Find the data collection procedure for measuring solar radiation by Solar Pyranometer. (BL1)
CO2	Explain the working of a Box Type Cooker. (BL2)

CO3	Illustrate performance analysis of different modes of solar panels. (BL3)
CO4	Complete the performance test of a solar pump. (BL3)

Paper Name: Renewable Energy Lab III Paper Code: PC-MRE 292

со	Description: After the completion of the course student will be able
CO1	Describe the working of an electrolyzer. (BL1)
CO2	Find different performance parameters of electrolyzer. (BL1)
CO3	Justify different laws related to electrolyzer and fuel cells. (BL5)
CO4	Complete the efficiency test of a fuel cell. (BL3)

Program Name: Bachelor of Statistics

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BSCS/AllSem21.pdf

Paper Name: Descriptive Statistics Paper Code: BSTAT 101

СО	Description: After the completion of the course student will be able
CO1	To learn different data types and their proper uses along with data handling, data representation, descriptive measures and exploratory analysis.
CO2	To analyze using measures of central tendency, dispersion and location for interpretation of statistical data.
CO3	To apply the concept of Principle of least squares for curve fitting and regression lines.
CO4	To learn about bivariate distributions as a closure approach to real world data and study the relationships between them.
CO5	To select different uses of index number techniques as a basic tool for synthesizing economic statistics.

Paper Name: Laboratory for Descriptive Statistics Paper Code: BSTAT 191

со	Description: After the completion of the course student will be able
CO1	To learn the basics of data handling, data representation, descriptive measures and exploratory analysis.
CO2	To apply mathematical ideas into statistical data analysis, interpretation of data.
CO3	To perform data analysis based on the statistical measures and interpreting the outcomes of the study.
CO4	To understand the mechanism of statistical decision making through exploratory data analysis.
CO5	To collect real data from the field of enquiry and prepare complete analytical findings of inner stories of a situation.

Paper Name: Basic Probability Paper Code: BSTAT 102

со	Description: After the completion of the course student will be able
CO1	Understand the idea of deterministic experiment and random experiment.
CO2	Apply the concept of probability as a measure of uncertainty in practical cases.
CO3	Understand the idea of prior, posterior and Bayes' theorem.
CO4	Learn the idea of random variables and its applications.

Paper Name: Speak English Professionally: In Person, Online & On the Phone Paper Code: BSTAT 104

со	Description: After the completion of the course student will be able
CO1	Learn to speak in English so that he/she can express their views on any topic without any difficulty in speech.

CO2	Use English effectively during the entire course curriculum and enable the learner to communicate effectively and appropriately in real life situations.
CO3	Develop and demonstrate the speaking skills for group discussions.

Paper Name: Application of Probability in Real Life Paper Code: BSTAT 201

СО	Description: After the completion of the course student will be able
CO1	Understand different probability models in different real-life situations for different types of data sets.
CO2	Learn about important probability distributions.
CO3	Make use of moments and moment generating functions.
CO4	Apply different probability distributions to fit different sets of data.

Paper Name: Laboratory for Probability

Paper Code: BSTAT 291

со	Description: After the completion of the course student will be able
CO1	Model a data set based on appropriate probability distribution.
CO2	Apply probability theory concepts to decision analysis using data from the actual world.
CO3	Understand the applicability of normality assumption across different data sets.

Paper Name: Mathematical Analysis Paper Code: BSTAT 202

со	Description: After the completion of the course student will be able
CO1	Describe the fundamental properties of the real numbers that underpin the formal development of real analysis.
CO2	Demonstrate an understanding of the theory of sequences and series, continuity, differentiation and integration.

CO3	Apply and analyze rigorous mathematical arguments.
CO4	Apply procedures like interpolation, Numerical integration and solution of Differential equation in different application areas.
CO5	Analyze and evaluate the accuracy of common numerical methods.

Paper Name: Laboratory for Introduction to Computer Programming using Python Paper Code: BSTAT 292

со	Description: After the completion of the course student will be able
CO1	Learn for writing, testing, and debugging simple Python programs.
CO2	Implement Python programs with conditionals and loops.
CO3	Use functions for structuring Python programs.

CO4 Read and write da	ta from/to files in Python.
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Paper Name: Environmental Science Paper Code: BSTAT 204

со	Description: After the completion of the course student will be able
CO1	Understand and evaluate the global scale of environmental problems.
CO2	Reflect critically on their roles, responsibilities, and identities as citizens, consumers and environmental actors in a complex, interconnected world.
CO3	Use critical thinking, problem-solving, and the methodological approaches of the social sciences, natural sciences, and humanities in environmental problem solving.

Paper Name: Sampling Distribution Paper Code: BSTAT 301

со	Description: After the completion of the course student will be able
CO1	Understand the function of random variables and their distribution.
CO2	Find out the interrelationships of different probability distributions.
CO3	Make use of the transformations in solving inferential problems.
CO4	Apply the family of distributions in real life situations.

Paper Name: Statistical Inference Paper Code: BSTAT 302

со	Description: After the completion of the course student will be able
CO1	Explain the statistical inference and its types.

CO2	Understand the desirable properties of an estimator and measures of finding a good estimate from sample data for practical use.
CO3	Determine various optimum tests for examining a hypothesis regarding a population parameter.
CO4	Apply the idea for carrying out research to analyze real-life data.

Paper Name: Laboratory for Statistical Inference Paper Code: BSTAT 391

со	Description: After the completion of the course student will be able
CO1	Apply theory of point estimation for analyzing sample observation.
CO2	Experiment with the notions of testing hypotheses in various fields e.g., biomedical, bio-science, geology, geography, behavioral science etc.
CO3	Determine sequential testing procedures under varying sample size.

Paper Name: Linear Algebra Paper Code: BSTAT 303

со	Description: After the completion of the course student will be able
CO1	Make use of computational techniques and algebraic skills essential for the study of systems of linear equations, matrix algebra, vector spaces, eigenvalues and eigenvectors, orthogonality.
CO2	Learn the diagonalizability of a square matrix and its corresponding applications.
CO3	Develop knowledge and ability for visualization, spatial reasoning, as well as geometric properties and strategies to model, solve problems and view solutions, especially in $\mathbb{R} \ 2$, $\mathbb{R} \ 3$ and extending these results to higher dimensions.
CO4	Determine the dimension of row or column space of a matrix with application.

Paper Name: Laboratory for Mathematical Methods for Computing Paper Code: BSTAT 392

со	Description: After the completion of the course student will be able
CO1	Derive unknown functions at least approximately using different interpolation formulas.
CO2	Analyze the accuracy for common numerical methods.
CO3	Find numerical solutions for different IVP and BVPs for ODE.
CO4	Estimate the solutions to a set of linear and nonlinear equations.
CO5	Build models based on the data through interpolation.

Paper Name: Python for Data analysis Paper Code: BSTAT 305 A

со	Description: After the completion of the course student will be able
CO1	Understand the principles of Python and acquire skills in programming in Python.
CO2	Understand the use of fundamental Python libraries to perform statistical analysis.
CO3	Generate meaningful visualization from data.
CO4	Manipulate, summarize, analyze and clean data.
CO5	Develop statistical models to solve problems arising in real life scenarios.

Paper Name: Statistical data analysis using R Paper Code: BSTAT 305 B

со	Description: After the completion of the course student will be able

CO1	Understand the software for ready use.
CO2	Use the software R for basic data analytic tools.
CO3	Apply R programming language to cross-check theoretical results.
CO4	Adopt programming skill as a fundamental industry requirement.

Paper Name: Survey Sampling Paper Code: BSTAT 401

СО	Description: After the completion of the course student will be able
CO1	Understand the idea of population, sample and sampling errors.
CO2	Learn about the selection procedure of a sample from a target population.

CO3	Learn about different techniques of survey sampling.
CO4	Estimate different population parameters, variances of these estimates under different survey sampling techniques.
CO5	Learn about the sample size determination and understand the idea of sub sampling.

Paper Name: Laboratory for Survey Sampling Paper Code: BSTAT 491

со	Description: After the completion of the course student will be able
CO1	Recognize the practical issues arising in sampling studies.
CO2	Analyze data from different types of sampling surveys.
CO3	Understand the principles underlying sampling as a procedure of making inferences about a population.

CO4	Understand the concepts of bias and sampling error and strategies for reducing these.

Paper Name: Statistical Quality Control Paper Code: BSTAT 402

со	Description: After the completion of the course student will be able
CO1	Understand the general idea of quality and monitoring of industrial experiments.
CO2	Understand the basic difference between process control and product control.
СОЗ	Adapt to control chart techniques and acceptance of sampling plans.
CO4	Make use of six-sigma methodology.

Paper Name: Laboratory for Statistical Quality Control Paper Code: BSTAT 492

со	Description: After the completion of the course student will be able
CO1	Understand the philosophy and basic concepts of quality improvement.
CO2	Acquire the ability to demonstrate the methods of statistical process control.
CO3	Interprete the control charts for variables and attributes and use them for decision making.
CO4	Understand the product control by using different inspection plans.

Paper Name: Linear Model Paper Code: BSTAT 403

со	Description: After the completion of the course student will be able
CO1	Build statistical models under various setups.

CO2	Analyze data sets using appropriate models.
CO3	Choose among the different available models in an efficient way.

Paper Name: Statistical Techniques for Research Methods Paper Code: BSTAT 405 A

со	Description: After the completion of the course student will be able
CO1	Apply statistical techniques for scientific understanding.
CO2	Choose the core statistical techniques through elaborated research.
CO3	Relate the inductive inferential logic into statistical thoughts.

Paper Name: Database Management Systems Paper Code: BSTAT 405 B

со	Description: After the completion of the course student will be able
CO1	Apply data manipulation and its processing through SQL.
CO2	Relate the basic concepts with the applications of database systems.
CO3	Apply the basics of SQL to construct queries.

Paper Name: Stochastic Process and Queuing Theory Paper Code: BSTAT 501

СО	Description: After the completion of the course student will be able
CO1	Recall the knowledge of probabilistic methods used in scientific applications.
CO2	Carry out derivations involving conditional probability distributions and conditional expectations.

CO3	Define basic concepts from the theory of Markov chains.
CO4	Demonstrate applicability of essential mathematical tools for handling stochastic processes.
CO5	Apply probabilistic and stochastic methods in modern engineering problems.
CO6	Classify different types of stochastic processes based on their properties.

Paper Name: Laboratory for Stochastic Process and Queuing Theory Paper Code: BSTAT 591

со	Description: After the completion of the course student will be able
CO1	Demonstrate applications of stochastic processes including Markov processes.
CO2	Apply the methods for determining the stationarity of a stochastic process.

CO3	Demonstrate different categories of birth and death process.
CO4	Learn to estimate different parameters of a queue.

Paper Name: Modern Statistical Techniques Paper Code: BSTAT 502

со	Description: After the completion of the course student will be able
CO1	Learn the concept of how to learn patterns and concepts from data.
CO2	Understand applications of ML in various functional areas & industries.
CO3	To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
CO4	To explore supervised and unsupervised learning paradigms of machine learning.

Paper Name: Laboratory for Modern Statistical Techniques Paper Code: BSTAT 592

СО	Description: After the completion of the course student will be able
CO1	Introduce students to the basic techniques of Machine Learning.
CO2	Develop skills of using recent machine learning software for solving practical problems.
CO3	Enable the students to: state-of-the-art methods and modern programming tools for data analysis using machine learning programs and algorithms.
CO4	Gain experience of doing independent study and research.

Paper Name: Design of Experiments Paper Code: BSTAT 601

СО	Description: After the completion of the course student will be able
CO1	Familiar with the basic principles and methods of statistical design of experiments.
CO2	Understand about the different types of formal experimental designs and Incomplete Block Designs.
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CO3	Describe the concept of variability, its causes and methods of reducing it.
CO4	Identify the experimental unit and recognise issues of non- independence.
CO5	Explain the fundamental concepts behind the output of an ANOVA (including "blocking" and "interactions").

Paper Name: Laboratory for Design of Experiments Paper Code: BSTAT 691

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со	Description: After the completion of the course student will be able
CO1	Analyze the data from the experiments.
CO2	Understand the potential practical problems in a design for a particular experiment.

CO3	Construct good or optimal designs for a range of practical experiments.
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Paper Name: Multivariate Analysis and Nonparametric Methods Paper Code: BSTAT 602

СО	Description: After the completion of the course student will be able
CO1	Understand the various multivariate techniques available.
CO2	Understand the concept of analyzing multivariate data.
CO3	Describe properties of bivariate and multivariate normal distribution.
CO4	Identify when to use a nonparametric method.
CO5	Understand different nonparametric methods in estimation, testing, model fitting and in analyses.

Program Name: M.Sc. in Applied Statistics and Analytics

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MSCMASA/AllSem22.pdf

Paper Name: Applied Linear Algebra Paper Code: MSASA101

СО	Description: After the completion of the course student will be able
CO1	Make use of computational techniques and algebraic skills essential for the study of systems of linear equations, matrix algebra, vector spaces, eigenvalues and eigenvectors, orthogonality and diagonalization.
CO2	Develop knowledge and ability for visualization, spatial reasoning, as well as geometric properties and strategies to model, solve problems and view solutions, especially in $R \ 2, R \ 3$ and extending these results to higher dimensions.
CO3	Apply algorithms of linear algebra to data science and particularly in the domain of machine learning.
CO4	Use appropriate technology, to enhance and facilitate mathematical understanding of data.
CO5	Determine acceptable solutions regarding understanding of data.

Paper Name: Elements of Real Analysis and Probability Paper Code: MSASA102

со	Description: After the completion of the course student will be able
CO1	Illustrate the knowledge of real numbers, least upper bounds, and the triangle inequality, define functions between sets; equivalent sets; finite, countable and uncountable sets.
CO2	Apply concepts of real analysis towards the statistical arena, e.g., limit theorems, large sample inferences and other areas.
CO3	Use appropriate knowledge to deal with random variables and their distributions.
CO4	Understand abstract ideas and rigorous methods for convergence of sequence and series to apply in a wide variety of domains like financial analysis, predicting behavior of market and other related areas.
CO5	Apply probability as a tool of sophisticated data analysis.

CO6	Explain the importance of paradigm shift from classical to Bayesian inference.

Paper Name: Statistical Inference and Introductory Analytics Paper Code: MSASA 103

со	Description: After the completion of the course student will be able
CO1	Apply Computational skills to implement various statistical inferential approaches.
CO2	Demonstrate the plausibility/validity of pre-specified ideas regarding the parameters of the model through hypothesis testing.
СОЗ	Apply non parametric methods as a distribution free statistical tool.
CO4	Illustrate the areas of applicability of analytics and statistics especially in the domain of machine learning.

Paper Name: Analytics using Python Programming Language Paper Code: MSASA 104

со	Description: After the completion of the course student will be able

CO1	Understand the principles of Python and acquire skills in programming in python.
CO2	Interpret the fundamental Python syntax and semantics and be fluent in the use of control flow statements.
CO3	Implement Python programs with conditionals and loops.
CO4	Organize compound data using Python lists, tuples, dictionaries, Files and modules.
CO5	Implement the python programming features in practical applications.
CO6	Develop the emerging applications of relevant fields using Python (Data Science).

Paper Name: Research Methodology & IPR Paper Code: MSASA 105

СО	Description: After the completion of the course student will be able

CO1	Adapt research methodology and explore the technique of defining a research problem.
CO2	Develop ability for literature review and carrying out a literature search.
CO3	Explain various research designs and their characteristics.
CO4	Make use of the details of sampling designs, measurement and scaling techniques along with different methods of data collections.
CO5	Determine applicability of various forms of the intellectual property with reference to its relevance and business impact in the changing scenario of the global business environment in appropriate cases.

Paper Name: Programming Language Laboratory Paper Code: MSASA 191

СО	Description: After the completion of the course student will be able
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CO1	Illustrate writing, testing, and debugging simple Python programs.
CO2	Implement Python programs with conditionals and loops.
CO3	Choose different functions for structuring Python programs.
CO4	Identify compound data using Python lists, tuples, dictionaries.
CO5	Apply methods for reading and writing data from/to files in Python.
CO6	Develop the programming in R as a tool for applied statistics.

Paper Name: Laboratory for Statistics and Linear Algebra Paper Code: MSASA 192

со	Description: After the completion of the course student will be able
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CO1	Understand the principles of basic statistics and acquire skills in statistical programming.
CO2	Interpret the fundamentals of exploratory data analysis and interpret the relevant diagrams.
CO3	Implement Python programs for different techniques of linear algebra for basic matrix operations, determination of eigenvalues and eigenvectors, matrix factorization with relevant applications in Machine learning/Data Science.
CO4	Implement the python/R programming in practical applications using compound data.

Paper Name: Regression for Predictive Model Building Paper Code: MSASA 201

со	Description: After the completion of the course student will be able
CO1	Understand the notion of statistical model building.
CO2	Demonstrate different aspects of regression diagnostics and their remedies.
CO3	Make use of different kinds of statistical models for suitable data.
CO4	Apply modern era regression based on decision tree and random forest.

Paper Name: Optimization Techniques and Soft Computing Paper Code: MSASA 202

со	Description: After the completion of the course student will be able
CO1	Relate real life minima/maxima problems into optimization framework.

CO2	Apply efficient computational procedures to solve linear and non-linear optimization problems.
CO3	Analyze the difference between ideas of various direct and indirect search methods.
CO4	Choose the applicability of different queuing models in real life cases.
CO5	Apply different soft computing techniques including Fuzzy logic and evolutionary algorithms.

Paper Name: Stochastic Processes and its Application Paper Code: MSASA 203

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со	Description: After the completion of the course student will be able
CO1	Recall the knowledge of probabilistic methods in engineering and scientific application.
CO2	Demonstrate applicability of essential mathematical tools for handling random processes.

CO3	Make use of the stochastic simulation techniques.
CO4	Apply probabilistic and stochastic methods in modern engineering problems.
CO5	Classify different types of stochastic processes based on their properties.

Paper Name: Time Series Analysis and Forecasting Methods Paper Code: MSASA 204

со	Description: After the completion of the course student will be able
CO1	Interpret time series data in the context of analytics.
CO2	Apply non stochastic and stochastic aspects of time series through different models.
CO3	Apply time series modeling in the share market or other arenas where volatility is frequent.

CO4	Demonstrate combined analysis both involving time series as well as regression.

Paper Name: Evolution of Statistical Thinking Paper Code: MSASA 205

со	Description: After the completion of the course student will be able
CO1	Develop awareness regarding inheritance of chance factors in different areas of life.
CO2	Learn the inspiring life and work of Stalwarts of Statistics.
CO3	Build ideas on basic principles of probability and how they may be abused.
CO4	Relate risk and uncertainty with real life problems.

Paper Name: Regression and Time Series Laboratory Paper Code: MSASA 291

со	Description: After the completion of the course student will be able
CO1	Understand the situation for applying regression and time series to a data set.
CO2	Apply predictive analytics for a response variable based on a set of covariates.
CO3	Make use of different software for conducting predictive analytics.

Paper Name: Optimization Techniques and Stochastic Process Laboratory Paper Code: MSASA292

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со	Description: After the completion of the course student will be able
CO1	Demonstrate different techniques of optimization.
CO2	Apply available software packages for obtaining the solution of different optimization problems.

CO3	Demonstrate applications of stochastic processes including Markov processes and Epidemic modeling.

Paper Name: Applied Multivariate and Data Mining Paper Code: MSASA 301

со	Description: After the completion of the course student will be able
CO1	Develop ideas about multivariate data and different multivariate probability distributions.
CO2	Relate the inferential aspects of multivariate models.
CO3	Illustrate principles of handling and mining of raw industrial data.
CO4	Apply different statistical techniques to deal with multivariate regression and ANOVA.

Paper Name: Machine Learning Algorithms Paper Code: MSASA 302

со	Description: After the completion of the course student will be able
CO1	Identify patterns and concepts from data.
CO2	Apply methods of Machine Learning in various functional areas & industries.
CO3	Analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
CO4	Differentiate supervised and unsupervised learning paradigms of machine learning.
CO5	Use reinforcement learning and evolutionary algorithms.
CO6	Apply Scalable Machine Learning techniques and various feature extraction strategies.

Paper Name: Advanced Business Analytics and Big Data Paper Code: MSASA 303

со	Description: After the completion of the course student will be able
CO1	Demonstrate the notion of big data and its application to analytics.
CO2	Apply the concept of advanced regression analysis.
CO3	Explain the ways to perform sentiment analysis.
CO4	Apply the methods for industrial raw data preprocessing.

Paper Name: Advanced Analytics using Software and Programming Language (SPSS, Hadoop, SAS)

Paper Code: MSASA 304

со	Description: After the completion of the course student will be able
CO1	Experiment with big data using Hadoop.

CO2	Develop solutions of different statistical problems using SPSS.
CO3	Analyze and interpret the output of SPSS and AMOS.
CO4	Apply statistical modeling using SAS.

Paper Name: Emerging Topics in Statistics and Analytics Paper Code: MSASA 306

со	Description: After the completion of the course student will be able
CO1	Develop awareness regarding recent developments of statistics in different areas of real life situations.
CO2	Decide the potential research areas involving modern developments of statistics and related interdisciplinary areas.
CO3	Acquire knowledge of modern tools of statistics.

Paper Name: Analytics Laboratory

Paper Code: MSASA 391

со	Description: After the completion of the course student will be able
CO1	Understand the idea of modern business intelligence.
CO2	Determine analytical solution to business problems.
CO3	Interpret people's behavioral patterns based on analytics.
CO4	Use analytics in every day's activity.

Paper Name: Machine Learning Lab Paper Code: MSASA 392

со	Description: After the completion of the course student will be able
CO1	Use basic techniques of Machine Learning.

CO2	Develop skills of using recent machine learning software for solving practical problems.
CO3	Develop the use of state-of-the-art methods and modern programming tools for data analysis using machine learning programs and algorithms.
CO4	Build the capacity for carrying independent study and research in the domain of Machine Learning.

Paper Name: Biostatistics Paper Code: MS ASA 401

СО	Description: After the completion of the course student will be able
CO1	Understand different biostatistical problems.
CO2	Apply statistical tools in medical science.
CO3	Design different stages of clinical trials.

CO4	Infer about the root cause of disease and its spread.
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Paper Name: Advanced Analytics Laboratory Paper Code: MSASA 491

СО	Description: After the completion of the course student will be able
CO1	Identify statistics as a tool in biomedical research.
CO2	Understand the application of statistics in modern technological research.
CO3	Use analytics in psephology.
CO4	Use analytics in sentiment analysis.

Program Name: B.Sc. in Bioinformatics

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BSCBI/AllSem20.pdf

Paper Name: CELL BIOLOGY Paper Code: BSBINC 101

со	Description: After the completion of the course student will be able
CO1	Relate the importance of listening and comprehending oral communication.
CO2	Recognize the difference between in depth reading and casual reading.
СОЗ	Explain the art of Oral Communication and its implication in organizational context.
CO4	Demonstrate about writing letters, notices, circulars and other written communication.
CO5	Prepare for interviews and deliver effective presentations.

Paper Name: Cell Biology Lab Paper Code: BSBINC 191

со	Description: After the completion of the course student will be able
CO1	Experiments with basic processes of cells by applying techniques.
CO2	Summarize results.
CO3	Illustrate the results and present a scientific report.

Paper Name: Introduction to Fundamental Computer Paper Code: BSBINC 102

СО	Description: After the completion of the course student will be able
CO1	Demonstrate a basic understanding of the generation of computers with classification and components.

CO2	Recognize the importance of Operating Systems, like process management, deadlocks, memory management, device management and file system.
CO3	Illustrate and apply the skills of various positional number systems, logic gates and Boolean function in the digital logic design field.

Paper Name: Fundamental Computer Lab Paper Code: BSBINC 192

со	Description: After the completion of the course student will be able
CO1	Apply Microsoft Word to solve different word processing related problems.
CO2	Apply Microsoft Excel to solve different Spreadsheet related problems.
CO3	Apply Microsoft powerpoint to solve different presentation related problems.
CO4	Apply the usage of MS-DOS commands.

Paper Name: English Communication Skill Development Paper Code: BSBINA101

СО	Description: After the completion of the course student will be able
CO1	Relate the importance of listening and comprehending oral communication.
CO2	Recognize the difference between in depth reading and casual reading.
CO3	Explain the art of Oral Communication and its implication in organizational context.
CO4	Demonstrate about writing letters, notices, circulars and other written communication.
CO5	Prepare for interviews and deliver effective presentations.

Paper Name: GENERAL MICROBIOLOGY Paper Code: BSBINC 201

со	Description: After the completion of the course student will
	be able

CO1	Summarize historical development and contributions of various scientists in the field of Microbiology and classify microbes.
CO2	Distinguish different staining procedures in microbiological experiments.
CO3	Describe microbial growth, different metabolic pathways along with various genetic exchange processes in bacteria.
CO4	Show the industrial applications of microbes especially in food, fermentation industry and also significance of water microbiology.

Paper Name: Lab on General Microbiology Paper Code: BSBINC 291

со	Description: After the completion of the course student will be able
CO1	Understand basic microbiological techniques and experimental procedures to execute experiments in Microbiology.
CO2	Apply different staining procedures.
CO3	Interpret results and present scientific reports.

Paper Name: Chemistry Paper Code: BSBINC202

СО	Description: After the completion of the course student will be able
CO1	Identify the firm foundation of basic chemistry.
CO2	Explain the chemical reactions and strategies to balance them, relative quantities of reactants and products, fundamentals of acid/base, atomic structure, radioactivity and nuclear structure of atoms etc.
CO3	Illustrate the Nomenclature and bonding in organic compound, Alkane, alkenes, alkynes, Aromatic Hydrocarbon, Stereochemistry, Alcohols, Ethers and Phenols, Aldehydes and ketones, carboxylic acid and their derivatives etc.
CO4	Apply the concept in problem solving, analytical reasoning as applied to scientific problems.

Paper Name: Lab on Chemistry Paper Code: BSBINC 292

со	Description: After the completion of the course student will be able
CO1	Understand the common laboratory techniques.
CO2	Apply the concept of the scientific method to create, test and evaluate the given experiments.
CO3	Examine the outcome of organic reactions using a basic understanding of the functional groups.

Paper Name: C Programming Language Paper Code: BSBINC203

со	Description: After the completion of the course student will be able
CO1	Describe the basic concepts of algorithm and programming.
CO2	Describe and apply several operators, types and control structures used in programming.

CO3	Describe and apply the concepts of array, function, pointer etc.
CO4	Describe and apply the concepts of String, Structure & Union and File concept.

Paper Name: C Programming Language Lab Paper Code: BSBINC 293

со	Description: After the completion of the course student will be able
CO1	Apply basic syntax of C language to solve simple problems.
CO2	Apply C language syntax to solve operators, data types and control structures related problems.
CO3	Apply C language syntax to solve array, function, pointer related problems.
CO4	<i>Apply</i> C language syntax to solve String, Structure & Union and File concept related problems.

Paper Name: Introduction to Environmental Science Paper Code: BSBINA 201

СО	Description: After the completion of the course student will be able
CO1	Demonstrate the basic concepts of environmental science as a medium for global welfare and creating the key components involved in environmental processes.
CO2	Describe the resource utilization, conservation and management domains, Enumerate energy manifestation technologies.
CO3	Describe the established environmental concerns and generate awareness of laws in the field of environment.
CO4	Illustrate the linking of social sciences with different environmental problems.

Paper Name: **Biochemistry and Metabolism** Paper Code: **BSBINC301**

СО	Description: After the completion of the course student will be able
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CO1	Outline the concept about the structure of carbohydrate, amino acids and higher order structure of proteins.
CO2	Explain the structure of lipids and categorize the genetic materials of living organisms.
CO3	Illustrate the mechanism of activities of different types of enzymes.
CO4	Discuss the energetics of living organisms by studying metabolism of carbohydrates and lipids.
CO5	Summarize the role of metabolism of amino acids and nucleotides to produce different functional molecules in the biological system.

Paper Name: Biochemistry and Metabolism Lab Paper Code: BSBINC391

со	Description: After the completion of the course student will be able
CO1	Understand and analyze the structures of biomolecules using computational tools.
CO2	Measuring H-bonds in the protein structures.

CO3	Analyze of Ramachandran plot and protein secondary structure.
CO4	Apply computational tools to analyze structures of Carbohydrates and lipids.

Paper Name: Basic Physics Paper Code: BSBINC302

со	Description: After the completion of the course student will be able
CO1	Recognize the concepts and functionalities of electronic devices.
CO2	Explain diffraction and its practical applications, introduced to the principles of lasers, types of lasers and their applications.
CO3	Describe some of the basic laws related to quantum mechanics as well as associated quantum mechanics calculations.

Paper Name: Basic Physics Lab Paper Code: BSBINC392

со	Description: After the completion of the course student will be able
CO1	Apply the skill to impart practical knowledge in real time solutions.
CO2	Demonstrate working principle, applications, measurement techniques and comparison of obtained results with theoretically calculated value.
CO3	Apply concepts in the practical solution of practical.
CO4	Apply measurement techniques, usage of new instruments and real time applications in Science and Technology.

Paper Name: DATA Structure Paper Code: BSBINC303

со	Description: After the completion of the course student will be able
CO1	Recall the basics of data structure and describe the prerequisite of the data structure and algorithm.
CO2	Demonstrate linear data structure, like linked list, stack and queue.

CO3	Explain the knowledge of non-linear data structure, like graphs and trees.
CO4	Apply different types of the searching and sorting algorithms.

Paper Name: Data Structure Lab Paper Code: BSBINC393

со	Description: After the completion of the course student will be able
CO1	Apply appropriate logic and data structure to solve a given problem.
CO2	Apply appropriate linear data structure to respective problems.
CO3	Apply appropriate non-linear data structure related problems.
CO4	Apply appropriate logic and data structure to solve searching and sorting problems.

Paper Name: Enzymology Paper Code: BSBINS301

со	Description: After the completion of the course student will be able
CO1	Demonstrate the process about the enzyme's purification and isolation.
CO2	Explain the classifications of enzymes and summarize the Enzyme substrate complex.
CO3	Estimate the mechanism of enzyme action.
CO4	Outline the concept of Enzyme Technology.

Paper Name: Industrial Fermentations Paper Code: BSBINS302

со	Description: After the completion of the course student will be able
CO1	Infer the basic concepts of industrial biochemical products, microbial polysaccharides and other types of biomolecules.
CO2	Explain secondary metabolites, overproduction of metabolites, enzyme immobilization techniques.
CO3	Distinguish different types of processing, fermentation processes and product recovery methods.
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CO4	Estimate the reaction enzyme kinetics and metabolic engineering of biosynthetic pathways.

Paper Name: Molecular Biology Paper Code: BSBINS303

со	Description: After the completion of the course student will be able
CO1	Identify the strong foundation on DNA structure and replication machineries.
CO2	Describe the sources and mechanism of DNA damage and repair.
CO3	Demonstrate the process of transcription and RNA processing.
CO4	Discuss on regulation of gene expression and protein synthesis.
CO5	Explain the basics of gene cloning technique and associated enzymes and vectors.

Paper Name: Basics of Bioinformatics and Methods Paper Code: BSBINC401

со	Description: After the completion of the course student will be able
CO1	Describe the basic concept of Bioinformatics.
CO2	Classify the different types of Biological Database.
CO3	Recognize different types of biological data storage, retrieval, and interoperability techniques.
CO4	Demonstrate the sequence analysis, gene expression techniques, and representation of their patterns.
CO5	Use the concept of molecular modeling and protein design.

Paper Name: **Basics of Bioinformatics and Methods LAB** Paper Code: **BSBINC491**

со	Description: After the completion of the course student will be able

CO1	Apply different types of biological databases.
CO2	Apply different types of tools for sequence comparison, gene finding, phylogenetic analysis.
CO3	Apply different tools to analyze protein structure.

Paper Name: **Bioanalytical Tools** Paper Code: **BSBINC402**

со	Description: After the completion of the course student will be able
CO1	Explain the functioning, maintenance and safety aspects of the basic apparatus used in a Biotechnology lab.
CO2	Explain the principles and applications of centrifuge, electrophoresis and chromatography in research and related experiments.
CO3	Apply the knowledge for the separation of proteins/peptides by selecting appropriate separation techniques.

CO4	Classify certain functionalities of biomolecules by using spectroscopic techniques.

Paper Name: Bioanalytical Tools Lab Paper Code: BSBINC492

со	Description: After the completion of the course student will be able
CO1	Demonstrate basic apparatus used in a Biotechnology lab.
CO2	Apply different types of centrifuge, electrophoresis and chromatography techniques.
CO3	Apply the knowledge for identification of different biomolecules by using spectroscopic techniques.

Paper Name: Molecular Diagnostics Paper Code: BSBINS401

со	Description: After the completion of the course student will be able

CO1	Summarize the basic idea of enzyme immunoassays.
CO2	Describe the molecular methods used in clinical microbiology.
CO3	Apply portable devices and assays & kits used for detect and diagnose diseases in human samples.
CO4	Demonstrate searching data, information, methodologies in order to set up and validate new diagnostic protocols.

Paper Name: Basics of Forensic Science Paper Code: BSBINS402

СО	Description: After the completion of the course student will be able
CO1	Describe the basic concepts of forensic science and laboratories and can classify the injuries and various types of deaths.

CO2	Classify the arms and explosives and compare handwriting.
CO3	Describe the role of toxicologists and applications of fingerprinting.
CO4	Outline the concept of DNA fingerprinting and cyber security.

Paper Name: Research methodology Paper Code: BSBINS403

СО	Description: After the completion of the course student will be able
CO1	Choose research problem formulation.
CO2	Analyze research related information.
CO3	Recognize research ethics.

Paper Name: Structural Bioinformatics Paper Code: BSBINC501

со	Description: After the completion of the course student will be able
CO1	Outline the basic concept of biomolecular structure.
CO2	Illustrate the concepts of protein structure and its mechanism of folding.
CO3	Summarize the RNA structure prediction methods.
CO4	Discuss the importance of Drug design & discovery.

Paper Name: Structural Bioinformatics Lab Paper Code: BSBINC591

со	Description: After the completion of the course student will be able
CO1	Explain and apply the modeling technique of protein.

CO2	Estimate the energy of the protein and predicting the salt bridge interactions in protein.
CO3	Experiment with energy minimization of protein and Molecular docking study of protein-ligand complex.
CO4	Identify the major and minor groove in DNA.
CO5	Examine different structures of nucleic acids.

Paper Name: **Programming in Python** Paper Code: **BSBINC502**

со	Description: After the completion of the course student will be able
CO1	Describe the basic concepts of python installation, programming syntax, and debugging.
CO2	Illustrate several types of operators and control structures used in programming.
CO3	Apply the concepts of String operation, File and Function.

CO4	Illustrate the concepts of List, Dictionaries and Tuples.

Paper Name: Programming in Python Lab Paper Code: BSBINC592

СО	Description: After the completion of the course student will be able
CO1	Apply the basic syntax of python to solve problems.
CO2	Apply several types of operators and control structures to solve given problems.
CO3	Apply the concepts of String operation, File and Function.
CO4	Apply the concepts of List, Dictionaries and Tuples.

Paper Name: IMMUNOLOGY Paper Code: BSBINC601

со	Description: After the completion of the course student will
	be able

CO1	Describe the history and concepts of immunology.
CO2	Distinguish Antigens, antibodies and Major Histocompatibility Complex.
CO3	Describe Complement System and Generation of Immune Response.
CO4	Show the application of different Immunological Techniques, Vaccines & Vaccination.

Paper Name: Immunology Lab Paper Code: BSBINC691

со	Description: After the completion of the course student will be able
CO1	Identify human blood groups, Leukocyte Count etc.
CO2	Implement immunodiffusion and Immunoelectrophoresis.
CO3	Experiment with antibody and antigen.

Paper Name: Data Analysis with R Paper Code: BSBINC602

СО	Description: After the completion of the course student will be able
CO1	Describe the basic concepts of R programming.
CO2	Understand and apply several operators, types and control structures used in programming.
CO3	Describe and apply the concepts of list, matrices, loop, functions etc.
CO4	Apply the programming to solve statistical problems and visualize the results.

Paper Name: Data Analysis with R LAB Paper Code: BSBINC692

со	Description: After the completion of the course student will
	be able

CO1	Apply basic syntax of R language to solve simple problems.
CO2	Apply R language syntax to solve operators, data types and control structures related problems.
CO3	Apply R language syntax to solve list, matrices, function related problems.
CO4	Apply R language syntax to solve statistical problems and File concept related problems.

Program Name: M. Sc. In Bioinformatics

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MSCBI/AllSem21.pdf

Paper Name: Molecular Biology Paper Code: MSBIN 101

со	Description: After the completion of the course student will be able
CO1	Describe the dynamic organization of cells.
CO2	Outline the basic structure of chromatin.
CO3	Summarize the details of various signal transduction processes in correlation with the biological impact like onset of cancer.
CO4	Apply the knowledge of Cellular processes techniques.
CO5	Define Manipulating and studying cells method.
CO6	Demonstrate the Genome instability and cell transformation process.

Paper Name: Computational Biochemistry Paper Code: MSBIN 102

СО	Description: After the completion of the course student will be able
CO1	<i>Memorize</i> the basic knowledge on biomolecules.
CO2	<i>Describe</i> the knowledge about chemical bonds.
CO3	<i>Explain</i> advanced knowledge about the enzyme kinetics and its reactions mechanism.
CO4	<i>Describe</i> the new hypothesis on designing and engineering of enzymes for industrial application.
CO5	<i>Outline</i> new insights on enzymes at the molecular level, their interactions, and design of biocatalyst.

Paper Name: Mathematics and Statistics Paper Code: MSBIN 103

со	Description: After the completion of the course student will
	be able

CO1	Apply basic statistical concepts commonly used in Biotechnology.
CO2	Use basic analytical techniques to generate results.
CO3	Demonstrate the design and analysis of statistical methods.Demonstrate and understand the central concepts of modern statistical theory and their probabilistic.
CO4	Demonstrate and understand the central concepts of modern statistical theory and their probabilistic foundation.
CO5	Apply biostatistician knowledge to real-life problems in research.

Paper Name: Application of Bio tools and Bio database Paper Code: MSBIN 104

со	Description: After the completion of the course student will be able
CO1	Distinguish different databases according to their function.

CO2	Select data retrieval system of chromosome structure, transcript components in 3 kingdoms of life.
CO3	Explain the algorithms behind different tools.
CO4	Describe the methods of protein modeling.

Paper Name: Data Structure and Application Paper Code: MSBIN 105

СО	Description: After the completion of the course student will be able
CO1	Describe the basics of data structure and recall the prerequisite of the data structure and algorithm.
CO2	Apply the knowledge of linear data structure, like array, linked list, stack and queue.
CO3	Apply the knowledge of non-linear data structure, like graph and tree.

CO4	Apply different types of the searching and sorting algorithms.
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Paper Name: Computational Biochemistry Lab Paper Code: MSBIN 192

со	Description: After the completion of the course student will be able
CO1	Analyze biomolecular crystallographic data.
CO2	<i>Test</i> the conformation of biomolecules/
CO3	Analyze of Ramachandran plot and protein secondary structure.
CO4	<i>Measuring</i> different chemical bonds in biomolecules.
CO5	Explain structural properties of enzymes and lipids.
CO6	Design of smart libraries for engineering protein stability.

Paper Name: Bioinformatics Lab Paper Code: MSBIN 194

со	Description: After the completion of the course student will be able
CO1	Apply different commands to the U/nix operating system.
CO2	Apply UNIX operating system in Linux platform.
CO3	Apply different commands in Shell Script.
CO4	Describe the concept of Mac operating system and server handling.

Paper Name: Data Structure and Application Lab Paper Code: MSBIN 195

со	Description: After the completion of the course student will be able
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CO1	Apply appropriate logic and data structure to solve a given problem.
CO2	Code on linear data structure respective problems.
CO3	Code on non-linear data structure related problems.
CO4	Apply appropriate logic and data structure to solve searching and sorting problems.

Paper Name: Structural Bioinformatics Paper Code: MSBIN 201

со	Description: After the completion of the course student will be able
CO1	<i>Outline</i> basic knowledge of protein structure and function.
CO2	<i>Summarize</i> new methods of analyzing and characterization of macromolecules for solving problems in protein chemistry
CO3	<i>Describe</i> accurate and comprehensive information about the classification of protein structures.

CO4	Apply the computational chemistry tools, and their the underlying theory
CO5	Discuss the dynamic behavior of proteins by computational molecular dynamics simulations method.

Paper Name: Genomics and Proteomics Paper Code: MSBIN 202

со	Description: After the completion of the course student will be able
CO1	Select different tools to submit and retrieve genomics and proteomics data from widely used public repositories.
CO2	Use tools to perform functional annotation of lists of genes and proteins.
CO3	Use bioinformatics tools to analyze genomics and proteomics data, involving identification and quantification approaches.
CO4	Choose statistical tools for Genome and Proteome data analysis.

Paper Name: Molecular Modeling and Molecular Dynamics Paper Code: MSBIN 203

со	Description: After the completion of the course student will be able
CO1	<i>Summarize</i> basic knowledge about the replica exchange technique in computational chemistry.
CO2	<i>Apply</i> the advanced MD Simulation techniques to solve complex biochemical problems.
CO3	<i>Produce</i> dynamic models by computational method and justify with experimental data.
CO4	<i>Describe</i> insights into biological systems using multi-scale engineering methods to analyze data in non-intuitive ways.
CO5	Explain how computer simulations of biomolecules can be used to investigate biological problems at the electronic level.

Paper Name: Computer Language (Python) Paper Code: MSBIN 204

со	Description: After the completion of the course student will be able
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CO1	Describe the basic concepts of python installation, operators and control structures programming syntax, and debugging.
CO2	Apply several types of String operation, List, and Function used in programming.
CO3	Describe and apply the concepts of File, Dictionaries, Tuples, and different useful Packages.
CO4	Apply python in the bioinformatics field.

Paper Name: Structural Bioinformatics Lab Paper Code: MSBIN 291

со	Description: After the completion of the course student will be able
CO1	Analyze secondary structure and motif of protein.
CO2	Apply different computational modeling tools and techniques for designing protein.
CO3	Describe and demonstrate the force field of biomolecules.

CO4	Experiment with energy minimization and molecular dynamics methods in biomolecules.
CO5	Explain and apply Free energy calculation method for ligands.

Paper Name: Genomics and Proteomics Lab Paper Code: MSBIN 293

со	Description: After the completion of the course student will be able
CO1	Apply knowledge to retrieve functional omics data, check quality of the data and process the data.
CO2	Identify the abundance and localization of RNA and proteins.
CO3	Apply different pipelines and analyze network modeling for scientific use.
CO4	Apply their bioinformatics knowledge and skills to critically assess the data characteristics, experimental design for efficient progress in high throughput biology.

Paper Name: Computer Language (Python) Lab Paper Code: MSBIN 294

со	Description: After the completion of the course student will be able
CO1	Describe the basic concepts of python installation, operators and control structures programming syntax, and debugging.
CO2	Understand and apply several types of String operation, List, and Function used in programming.
CO3	Describe and apply the concepts of File, Dictionaries, Tuples, and different useful Packages.
CO4	Apply python in bioinformatics.

Paper Name: Computational Drug Design Paper Code: MSBIN 301

со	Description: After the completion of the course student will be able
CO1	<i>Explain</i> the different techniques of structure based computational drug discovery methods.

CO2	<i>Apply</i> advanced concepts in Bioinformatics and Pharmacophores Modelling methods.
CO3	<i>Summarize the</i> knowledge about the physicochemical Properties and the techniques involved in the computational QSAR method. Thereby quantification and statistical representation of it.
CO4	<i>Explain</i> the knowledge about a drug candidate's safety, efficacy, and toxicity for regulatory approval.
CO5	Outline the concept of pharmacokinetic and pharmacodynamic profile of drug discovery process.

Paper Name: Systems Biology Paper Code: MSBIN 302

со	Description: After the completion of the course student will be able
CO1	Describe systems based approaches in biological sciences.
CO2	Select Systems Biology web-resources and tools that will help them in reconstructing and re-defining complex biological processes.

CO3 Choose an appropriate modeling technique to be used in a complex biological system.

Paper Name: Research Methodology and IPR Paper Code: MSBIN 303

со	Description: After the completion of the course student will be able
CO1	Select research problem formulation.
CO2	Explain research related information.
CO3	Describe research ethics.
CO4	Demonstrate the importance of computers in Bioinformatics.
CO5	Review the patent rights and licensing process.
CO6	Infer advanced IPR concept.

Paper Name: Computational Drug Design Lab Paper Code: MSBIN 391

со	Description: After the completion of the course student will be able
CO1	Experiment with molecular docking techniques between different biomolecules.
CO2	Analyze the ligand conformation, binding energy, and scoring function using different molecular docking programs.
CO3	Apply computational tools and Identify salt bridge interactions in protein.
CO4	Experiment with pharmacophore modeling and Virtual screening of ligand.
CO5	Apply computational tools for analyzing QSAR properties, ADMET and toxicity tests of ligands.
CO6	Design ligand for structure based drug discovery.

Paper Name: Computer Language (R) Lab Paper Code: MSBIN 395

СО	Description: After the completion of the course student will be able
CO1	Apply basic syntax of R language to solve simple problems.
CO2	Apply R language syntax to solve operators, data types and control structures related problems.
CO3	Apply R language syntax to solve list, matrices, function related problems.
CO4	Apply R packages to solve statistical problems and File concept related problems.
CO5	Apply R language to visualize graphs.

Paper Name: Communication Skill Paper Code: MSBIN 483

со	Description: After the completion of the course student will be able
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CO1	Demonstrate critical and innovative scientific thinking.
CO2	Display competence in oral, written, and visual scientific communication.
CO3	Apply Bioinformatics theories.
CO4	Show an understanding of opportunities in the field of Bioinformatics.
CO5	Use current technology related to the Bioinformatics field.

Program Name: M.Tech. In Bioinformatics

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MTECHBI/AllSem21.pdf

Paper Name: Cell & Molecular Biology Paper Code: MBIN 101

со	Description: After the completion of the course student will be able
CO1	Describe the dynamic organization of cells.
CO2	Outline the basic structure of chromatin.
CO3	Summarize the details of various signal transduction processes in correlation with the biological impact like onset of cancer.
CO4	Apply the knowledge of Cellular processes techniques.
CO5	Define Manipulating and studying cells method.
CO6	Demonstrate the Genome instability and cell transformation process.

Paper Name: Applied Biochemistry Paper Code: MBIN 102

со	Description: After the completion of the course student will be able
CO1	<i>Memorize</i> the basic knowledge on biomolecules.
CO2	Describe the knowledge about chemical bonds.
CO3	<i>Explain</i> advanced knowledge about the enzyme kinetics and its reactions mechanism.
CO4	<i>Describe</i> the new hypothesis on designing and engineering of enzymes for industrial application.
CO5	Outline new insights on enzymes at the molecular level, their interactions, and design of biocatalyst.

Paper Name: Mathematics and Statistics Paper Code: MBIN 103

со	Description: After the completion of the course student will be able
CO1	Apply basic statistical concepts commonly used in Biotechnology.
CO2	Use basic analytical techniques to generate results.
CO3	Demonstrate the design and analysis of statistical methods.
CO4	Demonstrate and understand the central concepts of modern statistical theory and their probabilistic foundation.
CO5	Apply biostatistician knowledge to real-life problems in research.

Paper Name: Bio tools and Bio database Paper Code: MBIN 104

со	Description: After the completion of the course student will be able
CO1	Distinguish different databases according to their function.

CO2	Select data retrieval system of chromosome structure, transcript components in 3 kingdoms of life.
CO3	Explain the algorithms behind different tools.
CO4	Describe the methods of protein modeling.

Paper Name: Data Structure and Algorithm Paper Code: MBIN 105

со	Description: After the completion of the course student will be able
CO1	Recall the basics of data structure and describe the prerequisite of the data structure and algorithm.
CO2	Adapt and apply the knowledge of linear data structure, like array, linked list, stack and queue.
CO3	Adapt and apply the knowledge of non-linear data structure, like graph and tree.

CO4	Apply different types of the searching and sorting algorithms.
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Paper Name: Applied Biochemistry Lab Paper Code: MBIN 192

со	Description: After the completion of the course student will be able
CO1	Analyze biomolecular crystallographic data.
CO2	<i>Test</i> the conformation of biomolecules.
CO3	Analyze of Ramachandran plot and protein secondary structure.
CO4	<i>Measuring</i> different chemical bonds in biomolecules.
CO5	Explain structural properties of enzymes and lipids.

Paper Name: Applied Bioinformatics Lab Paper Code: MBIN 194

со	Description: After the completion of the course student will be able
CO1	Apply different commands to the U/nix operating system.
CO2	Apply UNIX operating system in Linux platform.
CO3	Apply different commands in Shell Script.
CO4	Describe the concept of Mac operating system and server handling.

Paper Name: Data Structure and Algorithm Paper Code: MBIN 195

со	Description: After the completion of the course student will be able

CO1	Apply appropriate logic and data structure to solve a given problem.
CO2	Program on different linear data structure related problems.
CO3	Program on different non-linear data structure related problems.
CO4	Apply appropriate logic and data structure to solve searching and sorting problems.

Paper Name: Protein Engineering Paper Code: MBIN 201

со	Description: After the completion of the course student will be able
CO1	<i>Outline</i> basic knowledge of protein structure and function.
CO2	<i>Summarize</i> new methods of analyzing and characterization of macromolecules for solving problems in protein chemistry.
CO3	<i>Describe</i> accurate and comprehensive information about the classification of protein structures.
CO4	<i>Apply</i> the computational chemistry tools, and their underlying theory.
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CO5	Discuss the dynamic behavior of proteins by computational molecular dynamics simulations method.

Paper Name: Genomics and Proteomics Paper Code: MBIN 202

СО	Description: After the completion of the course student will be able
CO1	Select different tools to submit and retrieve genomics and proteomics data from widely used public repositories.
CO2	Use tools to perform functional annotation of lists of genes and proteins.
CO3	Use bioinformatics tools to analyze genomics and proteomics data, involving identification and quantification approaches.
CO4	Choose statistical tools for Genome and Proteome data analysis.

Paper Name: Bio-Molecular Dynamics Paper Code: MBIN 203

со	Description: After the completion of the course student will be able
CO1	<i>Summarize</i> basic knowledge about the replica exchange technique in computational chemistry.
CO2	<i>Apply</i> the advanced MD Simulation techniques to solve complex biochemical problems.
CO3	<i>Produce</i> dynamic models by computational method and justify with experimental data.
CO4	<i>Describe</i> insights into biological systems using multi-scale engineering methods to analyze data in non-intuitive ways.
CO5	Explain how computer simulations of biomolecules can be used to investigate biological problems at the electronic level.

Paper Name: Python in Bioinformatics Paper Code: MBIN 204

со	Description: After the completion of the course student will be able
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CO1	Describe the basic concepts of python installation, operators and control structures programming syntax, and debugging.
CO2	Apply several types of String operation, List, and Function used in programming.
CO3	Describe and apply the concepts of File, Dictionaries, Tuples, and different useful Packages.
CO4	Apply python in the bioinformatics field.

Paper Name: Protein Engineering Lab Paper Code: MBIN 291

со	Description: After the completion of the course student will be able
CO1	Analyze secondary structure and motif of protein.
CO2	Apply different computational modeling tools and techniques for designing protein.
CO3	Describe and demonstrate the force field of biomolecules.

CO4	Experiment with energy minimization and molecular dynamics methods in biomolecules.
CO5	Explain and apply Free energy calculation method for ligands.

Paper Name: Genomics and Proteomics Lab Paper Code: MBIN 292

со	Description: After the completion of the course student will be able
CO1	Apply knowledge to retrieve functional omics data, check quality of the data and process the data.
CO2	Identify the abundance and localization of RNA and proteins.
CO3	Apply different pipelines and analyze network modeling for scientific use.
CO4	Apply their bioinformatics knowledge and skills to critically assess the data characteristics, experimental design for efficient progress in high throughput biology.

Paper Name: Computational Programming Lab-I Paper Code: MBIN 294

со	Description: After the completion of the course student will be able
CO1	Describe the basic concepts of python installation, operators and control structures programming syntax, and debugging.
CO2	Apply several types of String operation, List, and Function used in programming.
CO3	Describe and apply the concepts of File, Dictionaries, Tuples, and different useful Packages.
CO4	Apply python in bioinformatics.

Paper Name: Drug Design Paper Code: MBIN 301

СО	Description: After the completion of the course student will be able
CO1	<i>Explain</i> the different techniques of structure based computational drug discovery methods.

CO2	<i>Apply</i> advanced concepts in Bioinformatics and Pharmacophores Modelling methods.
CO3	<i>Summarize the</i> knowledge about the physicochemical Properties and the techniques involved in the computational QSAR method. Thereby quantification and statistical representation of it.
CO4	<i>Explain</i> the knowledge about a drug candidate's safety, efficacy, and toxicity for regulatory approval.
CO5	Outline the concept of pharmacokinetic and pharmacodynamic profile of drug discovery process.

Paper Name: Systems Biology Paper Code: MBIN 302

со	Description: After the completion of the course student will be able
CO1	Describe systems based approaches in biological sciences.
CO2	Select Systems Biology web-resources and tools that will help them in reconstructing and re-defining complex biological processes.

Paper Name: Research Methodology and IPR Paper Code: MBIN 303

со	Description: After the completion of the course student will be able
CO1	Select research problem formulation.
CO2	Explain research related information.
CO3	Describe research ethics.
CO4	Demonstrate the importance of computers in Bioinformatics.
CO5	Review the patent rights and licensing process.
CO6	Infer advanced IPR concept.

Paper Name: Drug Design Lab Paper Code: MBIN 391

со	Description: After the completion of the course student will be able
CO1	Compute the molecular docking techniques by different biomolecules.
CO2	Analyze the ligand conformation, binding energy, and scoring function using different molecular docking programs.
CO3	Apply computational tools and Identify salt bridge interactions in protein.
CO4	Employ pharmacophore modeling and Virtual screening of ligand.
CO5	Apply computational tools for analyzing QSAR properties, ADMET and toxicity tests of ligands.
CO6	Design ligand for structure based drug discovery.

Paper Name: Computational Programming Lab-II Paper Code: MBIN 395

СО	Description: After the completion of the course student will be able
CO1	Apply basic syntax of R language to solve simple problems.
CO2	Apply R language syntax to solve operators, data types and control structures related problems.
CO3	Apply R language syntax to solve list, matrices, function related problems.
CO4	Apply R packages to solve statistical problems and File concept related problems.
CO5	Apply R language to visualize graphs.

Program Name: M. Tech in Artificial Intelligence

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MTECHITAI/AllSem.pdf

Paper Name: Mathematical foundations of Computer Science Paper Code: PGIT(AI)101

со	Description: After the completion of the course student will be able
CO1	Explain how to represent various statements using quantifiers, relations, functions, permutations and combinations, groups, graphs and trees.
CO2	Analyze the growth of functions and real world problems using various concepts like recurrence relations, graph coloring, etc.
CO3	Interpret various sampling and classification problems.
CO4	Apply mathematical logic to solve problems, pigeonhole principle to solve real time problems.
CO5	Make use of logical notation to define and reason about fundamental mathematical concepts such as sets, relations, and functions.
CO6	Make use of formulate problems and solve recurrence relations.

Paper Name: Advances in Artificial Intelligence Paper Code: PGIT(AI)102

со	Description: After the completion of the course student will be able
CO1	Recall fundamental understanding of the history of artificial intelligence (AI) and its foundations.
CO2	Evaluate tough real-world issues in a state space representation in order to solve them using AI approaches such as searching and game playing.
CO3	Create and test intelligent expert models for perception and prediction from intelligent environments.
CO4	Make use of decision-making strategies to develop viable solutions to issues with uncertain inputs or outcomes.
CO5	Show expertise to choose and apply AI technologies to synthesize information and construct models within the restrictions of the application domain.
CO6	Interpret the challenges associated in knowledge bases, reasoning systems, and application area planning limits.

Paper Name: Research Methodology and IPR Paper Code: PGIT(AI)105

со	Description: After the completion of the course student will be able
CO1	Understand research problem formulation.
CO2	Analyze research related information.
CO3	Follow research ethics.
CO4	Understand that today's world is controlled by Computer, Information Technology, but tomorrow's world will be ruled by ideas, concepts, and creativity.
CO5	Understanding that when IPR would take such an important place in the growth of individuals & nation, it is needless to emphasize the need for information about Intellectual Property Right to be promoted among students in general & engineering in particular.
CO6	Understanding that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about economic growth and social benefits.

Paper Name: English for Research Paper Writing Paper Code: PGIT(AI)106A

со	Description: After the completion of the course student will be able
CO1	Recognize, explain, and apply the formal features of certain organizational communication genres such as recommendations, analytical reports, proposals, memorandums, web pages, and promotional papers.
CO2	Learn how to enhance your writing abilities and readability level.
CO3	Understand how to critically examine research material, incorporate it into assigned writing effectively, simply, and logically, and properly cite the source.
CO4	Describe how to create a title, abstract, and introduction.
CO5	Use proper referencing style and punctuation as necessary.
CO6	Understand how to critically examine research material, incorporate it into assigned writing effectively, simply, and logically, and properly cite the source.

Paper Name: Disaster Management Paper Code: PGIT(AI)106B

со	Description: After the completion of the course student will be able
CO1	Explain the disaster management components; i.e. cycle, phases, risk, crisis, emergency, disasters, and resilience.
CO2	Compare hazards, disasters and associated natural phenomena and their interrelationships.
CO3	understand Medical and Psycho-Social Response to Disasters.
CO4	Apply knowledge about existing global frameworks and existing agreements and role of community in successful Disaster Risk Reduction.
CO5	Evaluate DM study including data search, analysis and presentation as a case study.
CO6	Create Technological innovations in Disaster Risk Reduction: Advantages and problems.

Paper Name: Sanskrit for Technical Knowledge Paper Code: PGIT(AI)106C

СО	Description: After the completion of the course student will be able
CO1	To get a working knowledge in illustrious Sanskrit, the scientific language in the world
CO2	Learning of Sanskrit to improve brain functioning
CO3	Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
CO4	The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Paper Name: Value Education Paper Code: PGIT(AI)106D

со	Description: After the completion of the course student will be able
CO1	understand the importance of value based living.
CO2	gain a deeper understanding about the purpose of their life.

CO3	understand and start applying the essential steps to become good leaders.
CO4	merge as responsible citizens with clear conviction to practice values and ethics in life.
CO5	develop value based professionals.
CO6	contribute in building a healthy nation.

Paper Name: Laboratory 1(Artificial Intelligence Lab) Paper Code: PGIT(AI)192

со	Description: After the completion of the course student will be able
CO1	Apply Data pre-processing techniques.
CO2	Explain artificial intelligence, its characteristics and its application areas.
CO3	Formulate real-world problems as state space problems, optimization problems or constraint satisfaction problems.

CO4	Select and apply appropriate algorithms and AI techniques to solve complex problems.
CO5	Design and develop an expert system by using appropriate tools and techniques.

Paper Name: Advanced Algorithms Paper Code: PGIT(AI)201

со	Description: After the completion of the course student will be able
CO1	design and analyze programming problem statements.
CO2	Select relevant data structures and algorithms, comprehend the ADT/libraries, and apply it to the construction of algorithms for a given issue.
CO3	Build the mathematical abstraction required to solve issues.
CO4	Create efficiency analyses and demonstrations of accuracy.

CO5	Adapt problem-specific algorithm design techniques.
CO6	Develop the analysis of efficiency and proof of correctness.

Paper Name: Artificial Neural Networks Paper Code: PGIT(AI)202

со	Description: After the completion of the course student will be able
CO1	Identify the distinction between a biological neuron and an artificial neuron.
CO2	Show about the various applications of neural networks.
CO3	Rephrase the components of Neural Networks.
CO4	Create neural network models.
CO5	Create apps that use neural networks.

CO6	Analyze the limitation of Single layer Perceptron and Develop MLP
	with 2 hidden layers.

Paper Name: Constitution of India Paper Code: PGIT(AI)205A

СО	Description: After the completion of the course student will be able
CO1	Describe the historical background of the constitution making and its importance for building a democratic India.
CO2	Explain the functioning of three wings of the government i.e., executive, legislative and judiciary.
CO3	Explain the value of the fundamental rights and duties for becoming a good citizen of India.
CO4	Analyze the decentralization of power between central, state and local self-governments.
CO5	Apply the knowledge in strengthening the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy of India.

Paper Name: Pedagogy Studies Paper Code: PGIT(AI)205B

Description: After the completion of the course student will be able
Oriented towards Basics of pedagogy and familiarized with the educational process.
Understand and select the best approaches to teaching
Develop a positive attitude towards life and teaching profession
Use the collaborative learning into a course in a way that aligns with students learning objectives and intended outcomes
Critically analyze the classroom teaching learning and the ability to observe classroom behavior.
Understand process of communication and use them in their classroom teaching and inculcate multiculturalism in their students.

Paper Name: Stress management by Yoga Paper Code: PGIT(AI)205C

со	Description: After the completion of the course student will be able
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CO1	Develop healthy mind in a healthy body thus improving social health also
CO2	Improve Concentration and focus
CO3	Improve efficiency

Paper Name: Personality development through life enlightenment skills Paper Code: PGIT(AI)205D

со	Description: After the completion of the course student will be able
CO1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
CO2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity
CO3	Study of Nitishatakam will help in developing the versatile personality of students.
CO6	

Paper Name: Artificial Neural Networks lab Paper Code: PGIT(AI)292

со	Description: After the completion of the course student will be able
CO1	Study of Matlab or Python
CO2	Understand cognitive tasks and processing of sensorial data such as vision, image- and speech recognition, control, robotics, expert systems
CO3	design single and multi-layer feed-forward neural networks
CO4	understand supervised and unsupervised learning concepts & understand unsupervised learning
CO5	understand training of recurrent Hopfield networks and associative memory concepts.

Program Name: Bachelor of Computer Application (Honours)

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BCA/sem120.pdf

Paper Name: Programming for Problem Solving Paper Code: BCAC101

со	Description: After the completion of the course student will be able
CO1	To develop simple algorithms for arithmetic and logical problems.
CO2	To translate the algorithms to programs and execution.
CO3	To implement conditional branching, iteration and recursion.
CO4	To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
CO5	To use arrays, pointers and structures to develop algorithms and programs.

Paper Name: Digital Electronics Paper Code: BCAC102

СО	Description: After the completion of the course student will be able
CO1	Compare between analog and digital systems.
CO2	Solve different types of codes and number systems which are used in digital communication and computer systems.
CO3	Analyze Boolean laws and K-map to simplify the digital circuits.
CO4	Apply the various digital Combinational circuits and their operation.
CO5	Apply the various digital Sequential Circuits and their operation.

Paper Name: Soft Skills Paper Code: BCAA101

со	Description: After the completion of the course student will be able
CO1	Understand importance of self-awareness, values and leadership skills in capacity buir.

CO2	Understand and analyze the factors affecting interpersonal skills.
CO3	Understand and evaluate the concepts of vision, mission and goals for corporate skills.
CO4	Understand, apply and analyze the importance of body language, time management and stress management.
CO5	Understand the concept and need for a self development plan.

Paper Name: Programming for Problem Solving (Lab) Paper Code: BCAC191

со	Description: After the completion of the course student will be able
CO1	Simple programs to understand the concepts of data types, operations and expressions.
CO2	Familiarizing conditional and control statements.
CO3	Implementing Concept of arrays and String to solve problems.

CO4	Implementation of functions, pointers, operation on pointers and dynamic storage allocation.
CO5	Defining and handling structures, array of structures, union and processing data.

Paper Name: Digital Electronics (Lab) Paper Code: BCAC192

со	Description: After the completion of the course student will be able
CO1	Implement the designing of BCD to seven segment displays.
CO2	Analyze the working functionality of Half adders and full Adders.
CO3	Analyze the working functionality of the subtractor.
CO4	Examine the procedures for the analysis and design of Multiplexers and demultiplexers.
CO5	Analyze the working functionality of the decoder.

CO6	Designing registers.	of	various	types	of	sequential	circuits	like	flip	flops,

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BCA/sem220.pdf

Paper Name: Discrete Structures Paper Code: BCAC201

со	Description: After the completion of the course student will be able
CO1	Express a logic sentence in terms of predicates, quantifiers and logical connectives.
CO2	Derive the solution for a given problem using deductive logic and prove the solution based on logical inference.
CO3	Classify its algebraic structure for a given mathematical problem.
CO4	Evaluate Boolean functions and simplify expressions using the properties of Boolean Algebra.
CO5	Develop the given problem as graph networks and solve them with techniques of graph theory.

со	Description: After the completion of the course student will be able
CO1	Understand basic structure of digital computer, instruction set, number system, and arithmetic operations.
CO2	Learn the basic structure of stored program concepts and different arithmetic and control unit operations.
CO3	Become skilled at memory hierarchy and mapping techniques.
CO4	Study the techniques that computers use to communicate with peripheral devices.
CO5	Understand parallel architecture, pipelines, and interconnection networks.
CO6	Design the non Von-Neumann architectures.

Paper Name: Environmental Science Paper Code: BCAA201

СО	Description: After the completion of the course student will be able
CO1	describe the natural environment and its relationships with human activities.
CO2	learn fundamental Knowledge of science and engineering to assess environmental and health risk.
CO3	develop guidelines and procedures for health and safety issues obeying environmental laws and regulations.
CO4	acquire skills for scientific problem-solving related to air, water, noise & land pollution.
CO5	gain knowledge on how to perform EIA, Environmental Audit to assess the impact and further development.

Paper Name: Computer Architecture(Lab) Paper Code: BCAC292

со	Description: After the completion of the course student will be able
CO1	Define the basic structure of stored program concepts and different arithmetic and control unit operations.

CO2	Demonstrate the memory hierarchy and mapping techniques and the wide variety of memory technologies both internal and external.
CO3	Model the instruction and arithmetic pipeline, pipeline hazards, and techniques for handling hazards.
CO4	Distinguish different instruction-level parallelism, array and vector processing principles.
CO5	Explain the functions of different multiprocessor architectures and Cluster computers.
CO6	Design the non Von-Neumann architectures.

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BCA/sem3420.pdf

Paper Name: Object Oriented Programming Paper Code: BCAC301

со	Description: After the completion of the course student will be able
CO1	Analyze the drawbacks of Procedure Oriented Programming comparing with the concepts of Object Oriented Programming paradigm & C++ language features in program design.

CO2	Identify the role of Classes & Objects, constructors & destructors in program design.
CO3	Design various forms of inheritance and analyze how base class constructors are called.
CO4	Evaluate operator overloading, runtime polymorphism Programming through examples.
CO5	Explore exception handling and various Stream classes, I/O operations in handling file operations.

Paper Name: Operating Systems Paper Code: BCAC302

СО	Description: After the completion of the course student will be able
CO1	Gaining knowledge about the operating system, function of operating system, types of operating system.
CO2	Know and understand the process concept, process states, and the process scheduling techniques.
CO3	Apply the concept of process scheduling and deadlock avoidance to know the technique used by the operating system to do all these works.

CO4	Apply and evaluate the concept of threads, process synchronization for the smooth and successful running of the user and kernel processes.
CO5	Apply the concept of memory management techniques to efficiently utilize the physical memory of the computer.

Paper Name: Data Structure and Algorithm using Python Paper Code: BCAC303

со	Description: After the completion of the course student will be able
CO1	Summarize the concept of data structure, data type and array data structure.
CO2	Implement linked list data structure to solve various problems.
CO3	Apply various data structures such as stacks, queues, trees and graphs to solve various computing problems using Python-programming language.
CO4	Compare the standard algorithms for searching and sorting.
CO5	Evaluate the performance of an algorithm in terms of complexity using asymptotic notation.

CO6	Choose effectively the data structure that efficiently model the information in a problem.
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Paper Name: Object Oriented Programming (Lab) Paper Code: BCAC391

со	Description: After the completion of the course student will be able
CO1	Analyze the drawbacks of Procedure Oriented Programming compared with the concepts of Object Oriented Programming paradigm & C++ language features in program design.
CO2	Identify the role of Classes & Objects, constructors & destructors in program design.
CO3	Design various forms of inheritance and analyze how base class constructors are called.
CO4	Evaluate operator overloading, runtime polymorphism Programming through examples.
CO5	Explore exception handling and various Stream classes, I/O operations in handling file operations.

Paper Name: Operating Systems (Lab) Paper Code: BCAC392

со	Description: After the completion of the course student will be able
CO1	Programming in C to implement FCFS, SJF, RR, SRTF, HRRN.
CO2	Programming in C to implement Deadlock Avoidance and Deadlock Prevention.
CO3	Understand the fundamental concept of shell script.
CO4	Apply the concepts of operators in shell script.
CO5	Apply the concept of Loop, Array, Function in shell script.

Paper Name: Data Structure and Algorithm using Python (Lab) Paper Code: BCAC393

со	Description: After the completion of the course student will be able
CO1	Represent data for efficient processing using the fundamental concept of Data Structure.
CO2	Develop applications using the search algorithms and sorting algorithms based on their time complexities.
CO3	Develop applications using the concepts of linear data structure like stack, queue and Linked List for different requirements.
CO4	Implement non-linear data structures like trees and graphs.
CO5	Design the application using the data structure that efficiently models the information in a problem.

Paper Name: Web Design and Development Paper Code: BCAS391

со	Description: After the completion of the course student will be able
CO1	Explain internet development techniques and Protocols leading Web.

CO2	Understand the different approaches in network security models.
CO3	Design different web pages using HTML, XML, CSS, JavaScript, and Java applet.
CO4	Create client-server model using socket programming techniques.
CO5	Develop interactive internet/web applications based on Servlets and JSP.

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BCA/sem3420.pdf

Paper Name: Database Management System Paper Code: BCAC401

со	Description: After the completion of the course student will be able
CO1	Illustrate the different components of database and data model.
CO2	Design the databases using E R method and normalization for a given specification of the requirement.
CO3	Construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2.
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CO4	Optimize query execution using Query optimization algorithms.
CO5	Determine the transaction atomicity, consistency, isolation, and durability for a given transaction-processing system.
CO6	Justify the ACID property based on locking, time stamping algorithm on concurrency control and Serializability of scheduling.

Paper Name: Software Engineering Paper Code: BCAC402

СО	Description: After the completion of the course student will be able
CO1	Identify software Engineering problems .Specification, performance, maintenance and quality requirements.
CO2	Select modern engineering tools necessary for software project management, time management and software reuse.
CO3	Analyze, elicit and specify software requirements through a productive working relationship with various stakeholders of the project.

CO4	Distinguish different testing strategies and it's working.
CO5	Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
CO6	Develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice.

Paper Name: Design and Analysis of Algorithms Paper Code: BCAC403

СО	Description: After the completion of the course student will be able
CO1	Define the Significance of Algorithm, its features and Phases and how to formulate and solve complex engineering problems related to Computer Science and Engineering.
CO2	Explain the mathematical expressions to prove asymptotic bounds for time complexity and use asymptotic notation to formulate the time and space requirements of complex problems.
CO3	Choose the fundamental techniques to design the algorithms efficiently. Understanding of basic recursive problems, finding recurrence relations and solving sorting problems (quick sort and merge sort) by divide and conquer approach.

CO4	Define dynamic programming approach and build solutions for the optimization problems like chain matrix multiplication, all pair shortest path etc. Analyze the concept of greedy technique and apply it to solve the problems like single pair shortest path, minimum spanning tree using two popular methods- prim's algorithm and Kruskal algorithm.
CO5	Explain the back tracking methodology and develop 8 Queens problem and graph coloring problem using it, also develop branch- and-bound algorithms.

Paper Name: Database Management System (Lab) Paper Code: BCAC491

СО	Description: After the completion of the course student will be able
CO1	Illustrate different types of SQL commands.
CO2	Formulate queries using SQL operators.
CO3	Apply different types of joining operations on multiple tables.
CO4	Implement various queries using different functions and elaborate nested queries.

CO5	Construct Views.
CO6	Describe the concept of cursor and triggers.

Paper Name: Software Engineering (Lab) Paper Code: BCAC492

СО	Description: After the completion of the course student will be able
CO1	To handle software development models through rational methods.
CO2	To prepare SRS document, design document, test cases and software configuration management and risk management related documents.
CO3	To Develop function oriented and object oriented software design using tools like rational rose.
CO4	To perform unit testing and integration testing.
CO5	To apply various white box and black box testing techniques.

CO6	Able to Plan a software engineering process life cycle.
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Paper Name: Design and Analysis of Algorithms (Lab) Paper Code: BCAC493

со	Description: After the completion of the course student will be able
CO1	Solve some problems using recursion.
CO2	Develop searching algorithms and sorting algorithms.
CO3	Represent Tree & Graphs and solve Bin Packing & TSP.
CO4	Implement KMP, BFS and DFS algorithms.
CO5	Estimate the minimum cost of spanning tree, minimum cost of any two nodes of a graph, etc.

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BCA/sem5620.pdf

Paper Name: Internet Technology Paper Code: BCAC501

СО	Description: After the completion of the course student will be able
CO1	Define the principle of Internetworking, TCP/IP protocols, World Wide Web, client-server architecture, IP addressing, routing etc.
CO2	Explain the need for secured web application development with client-side, server-side scripting languages.
CO3	Construct web programs using the web languagesHTML, XML, JavaScript, Applet, Perl, etc.
CO4	Design and Develop small interactive websites using modern tools following the professional web based engineering solutions, ethics and management techniques.
CO5	Explain the advanced technologies like network security, multimedia applications, search engine, web crawler, etc with the websites.

Paper Name: Computer Networking Paper Code: BCAC502

СО	Description: After the completion of the course student will be able
	be able

CO1	Explain the basics of computer networking, different network models and architecture.
CO2	Analyze different networking functions and features for identifying optimal solutions.
CO3	Apply different networking concepts for implementing network solutions.
CO4	Evaluate and implement routing algorithms for implanting solutions for the real life problems.
CO5	Develop an implementation model of fault tolerant computer networks.

Paper Name: Internet Technology Lab Paper Code: BCA591

со	Description: After the completion of the course student will be able
CO1	Explain internet development techniques and Protocols leading Web.

CO2	Understand the different approaches in network security models.
CO3	Design different web pages using HTML, XML, CSS, JavaScript, and PHP-MYSQL.
CO4	Create client-server model using socket programming techniques.
CO5	Develop interactive internet/web applications based on PHP and MYSQL.

Paper Name: Computer Networking Lab Paper Code: BCA592

СО	Description: After the completion of the course student will be able
CO1	Apply different network commands.
CO2	Analyze different networking functions and features for implementing optimal solutions.
CO3	Apply different networking concepts for implementing network solutions.

CO4	Evaluate and Implement different network protocols.
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Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BCA/sem5620.pdf

Paper Name: Advanced Database and PLSQL Paper Code: BCAC601

со	Description: After the completion of the course student will be able
CO1	Understand and analyze transaction processing and concurrency control.
CO2	Describe how XML query are being processed and executed.
CO3	Explain the concept of distributed database architecture & design and web technology using databases.
CO4	Summarize the concepts of data warehousing, OLAP, Data mining and physical database design.
CO5	To understand the concepts of multimedia databases with the emerging technologies.
CO6	To make use of online analytical systems for knowledge discovery.

Paper Name: Theory of Computation Paper Code: BCA602

со	Description: After the completion of the course student will be able
CO1	Outline the concept of Finite Automata and Regular Expression.
CO2	Illustrate the design of Context Free Grammar for any language set.
CO3	Demonstrate the push down automaton model for the given language.
CO4	Make use of the Turing machine concept to solve the simple problems.
CO5	Explain decidability or undecidability of various problems.

Paper Name: Advanced Database and PLSQL Lab Paper Code: BCA691

со	Description: After the completion of the course student will be able
CO1	Understand the concept of Database transactions management.
CO2	Understand the concept of concurrency control techniques and recovery management.
CO3	Gain ideas about distributed DBMS.
CO4	To gain skill to write PL-SQL.

Program Name: B.Sc. in Information Technology (Cyber Security)

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BSCCS/AllSem20.pdf

Paper Name: Programming Fundamental Paper Code: BITCSC101

со	Description: After the completion of the course student will be able
CO1	Identify the need and use of programming in a real world environment.
CO2	Illustrate the C data types, syntax and constructs.
CO3	Compare decision making, branching and looping statements.
CO4	Explain the concept of Array, Pointer and Strings to solve different problems.
CO5	Develop the concepts of Function modules, their usage and memory allocation.
CO6	Classify the concepts of structured data.

Paper Name: Discrete Structures Paper Code: BITCSC102

СО	Description: After the completion of the course student will be able
CO1	Demonstrate the solution for a given problem using mathematical procedures.
CO2	Relate to the mathematical tools of logic and induction.
CO3	Discover inductive definitions and proofs, with application to problems in computer science.
CO4	Discuss proofs of partial program correctness, finite state automata and modular arithmetic.
CO5	Inspect theorems concerning relations, functions, and sets.
CO6	Apply mathematical knowledge to problem solving.

Paper Name: Soft Skill Paper Code: BITCSA101

со	Description: After the completion of the course student will be able
CO1	To enable the learner to communicate effectively and appropriately in real life situations.
CO2	To use English effectively for study purposes across the curriculum.
CO3	To use R,W,L,S and integrate the use of four language skills, Reading, writing , listening and speaking.
CO4	To revise and reinforce structures already learnt.
CO5	Ability to understand English when it is spoken in various contexts.
CO6	Skill to develop the ability to write English correctly and master the mechanics of writing.

Paper Name: Programming Fundamentals Lab Paper Code: BITCSC191

со	Description: After the completion of the course student will be able
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CO1	Simple programs to understand the concepts of data types, operations and expressions.
CO2	Familiarizing conditional and control statements.
CO3	Implementing Concept of arrays and String to solve problems.
CO4	Implementation of functions, pointers, operation on pointers and dynamic storage allocation.
CO5	Defining and handling structures, array of structures, union and processing data.

Paper Name: Data Structure and Algorithm with Python Paper Code: BITCSC201

со	Description: After the completion of the course student will be able
CO1	Ability to analyze algorithms and to determine algorithm correctness and time efficiency class.
CO2	Formulate a variety of advanced abstract data types (ADT) and data structures and their implementations.

CO3	Experiment with different algorithm design techniques (brute-force, divide and conquer, greedy, etc.
CO4	Ability to apply and implement learned algorithm design techniques and data structures to solve problems.
CO5	Examine algorithmic complexity and optimization techniques.
CO6	To perceive the importance of structured data in real world problem solving.

Paper Name: Operating System Paper Code: BITCSC202

СО	Description: After the completion of the course student will be able
CO1	Explain the structure of different operating systems and different functionalities of it.
CO2	Identify process ,thread , the communication between application programs and hardware devices through system calls.

CO3	Analyze and CPU scheduling algorithm. Inspect process synchronization and its consequences.
CO4	Inspect process synchronization and deadlock.
CO5	Apply different memory management schemes.
CO6	Analyze different file systems, I/O devices, disk scheduling and different security vulnerabilities.

Paper Name: Environmental Science Paper Code: BITCSA201

СО	Description: After the completion of the course student will be able
CO1	describe the natural environment and its relationships with human activities.
CO2	learn fundamental Knowledge of science and engineering to assess environmental and health risk.
CO3	develop guidelines and procedures for health and safety issues obeying environmental laws and regulations.

CO4	acquire skills for scientific problem-solving related to air, water, noise & land pollution.
CO5	gain knowledge on how to perform EIA, Environmental Audit to assess the impact and further development.

Paper Name: Data Structure and Algorithm with Python Lab Paper Code: BITCSC291

со	Description: After the completion of the course student will be able
CO1	Represent data for efficient processing using the fundamental concept of Data Structure.
CO2	Develop applications using the search algorithms and sorting algorithms based on their time complexities.
CO3	Develop applications using the concepts of linear data structure like stack, queue and Linked List for different requirements.
CO4	Implement non-linear data structures like trees and graphs.
CO5	Design the application using the data structure that efficiently model the information in a problem

Paper Name: Operating System Lab Paper Code: BITCSC292

со	Description: After the completion of the course student will be able
CO1	Programming in C to implement FCFS, SJF, RR, SRTF, HRRN.
CO2	Programming in C to implement Deadlock Avoidance and Deadlock Prevention.
CO3	Understand the fundamental concept of shell script.
CO4	Apply the concepts of operators in shell script.
CO5	Apply the concept of Loop, Array, Function in shell script.

Paper Name: DBMS and SQL injection Attack Paper Code: BITCSC301

со	Description: After the completion of the course student will be able
CO1	Illustrate the different components of database and data model.
CO2	Design the databases using E R method and normalization for a given specification of the requirement.
CO3	Construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2.
CO4	Optimize query execution using Query optimization algorithms.
CO5	Determine the transaction atomicity, consistency, isolation, and durability for a given transaction-processing system.
CO6	Justify the ACID property based on locking, time stamping algorithm on concurrency control and Serializability of scheduling.

Paper Name: Information Security Paper Code: BITCSC302

СО	Description: After the completion of the course student will be able
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CO1	Develop an understanding of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.
CO2	Discusses the wide range of technologies, available tools, and practical approaches in information security and cyberspace.
CO3	Gain familiarity with prevalent network and distributed system attacks, defenses against them, and forensics to investigate the aftermath.
CO4	Understanding of cryptography, how it has evolved, and some key encryption techniques used today.
CO5	Develop an understanding of security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges.
CO6	Apply their knowledge in the security applications.

Paper Name: Ethical Hacking Paper Code: BITCSC303

со	Description: After the completion of the course student will be able
CO1	learn Network Footprinting, Collect System Information, Collect Organization's information.

CO2	understand Legal aspects of penetration testing.
CO3	develop Practical hacking exercises.

Paper Name: DBMS and SQL injection Attack Paper Code: BITCSC391

со	Description: After the completion of the course student will be able
CO1	Illustrate the different components of database and data model.
CO2	Design the databases using E R method and normalization for a given specification of the requirement.
CO3	Construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2.
CO4	Optimize query execution using Query optimization algorithms.
CO5	Determine the transaction atomicity, consistency, isolation, and durability for a given transaction-processing system.

CO6	Justify the ACID property based on locking, time stamping algorithm on
	concurrency control and Serializability of scheduling.

Paper Name: Information Security Paper Code: BITCSC392

со	Description: After the completion of the course student will be able
CO1	provide a background in the many aspects of security management associated with today's modern communications and networks.
CO2	Knowledge of the fundamentals of Risk Analysis, Risk Management, Security Policy, Security Operations, Legal issues, Business issues and Secure Systems Development.
CO3	Understand the role of Security Management in information technology.
CO4	Quantify the properties of Information Security systems.
CO5	Demonstrate understanding of the role of firewalls, guards, proxy servers and intrusion detection in networks on a Linux OS with traffic analysis.

CO6	Evaluate the residual risk of a protected network.
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Paper Name: Web Development Paper Code: BITCSS391

со	Description: After the completion of the course student will be able
CO1	Perform a full web audit and extract insights from your web analytics platform.
CO2	Optimize SEO and SEM to drive traffic to your brand.
CO3	Understand your audience, what a customer journey is, and the importance and complexity of expressing your brand online.
CO4	Communicate with all stakeholders about web analytics.
CO5	Design dashboards in line with best practices and produce impactful presentations to share your insights and recommendations with managers and peers.

Paper Name: Computer Networks Paper Code: BITCSC401

со	Description: After the completion of the course student will be able
CO1	Explain the basics of computer networking, different network models and architecture.
CO2	Analyze different networking functions and features for identifying optimal solutions.
CO3	Apply different networking concepts for implementing network solutions.
CO4	Evaluate and implement routing algorithms for implanting solutions for the real life problems.
CO5	Develop an implementation model of fault tolerant computer networks.

Paper Name: Software Engineering Paper Code: BITCSC402

со	Description: After the completion of the course student will be able
CO1	Identify software Engineering problems .Specification, performance, maintenance and quality requirements.

CO2	Select modern engineering tools necessary for software project management, time management and software reuse.
CO3	Analyze, elicit and specify software requirements through a productive working relationship with various stakeholders of the project.
CO4	Distinguish different testing strategies and it's working.
CO5	Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
CO6	Develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice.

Paper Name: Cyber Security: Vulnerabilities & Safeguards Paper Code: BITCSC403

СО	Description: After the completion of the course student will be able
CO1	Understand, appreciate, employ, design and implement appropriate security technologies and policies to protect computers and digital information.

CO2	Identify & Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real-time.
CO3	Identify common trade-offs and compromises that are made in the design and development process of security metrics.
CO4	Examine the importance of cryptography in cyber security and privacy measures, learn about authorization, integrity and confidentiality metrics.
CO5	To learn about cyber forensics and how to execute preliminary investigations of cyber threats.
CO6	Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection.

Paper Name: Computer Networks Lab Paper Code: BITCSC491

со	Description: After the completion of the course student will be able
CO1	Apply different network commands.

CO2	Analyze different networking functions and features for implementing optimal solutions.
CO3	Apply different networking concepts for implementing network solutions.
CO4	Evaluate and Implement different network protocols.

Paper Name: Software Engineering Lab Paper Code: BITCSC492

со	Description: After the completion of the course student will be able
CO1	To handle software development models through rational methods.
CO2	To prepare SRS document, design document, test cases and software configuration management and risk management related documents.
CO3	To Develop function oriented and object oriented software design using tools like rational rose.
CO4	To perform unit testing and integration testing.

CO5	To apply various white box and black box testing techniques.
CO6	Able to Plan a software engineering process life cycle.

Paper Name: Information and Coding Theory Paper Code: BITCSC501

со	Description: After the completion of the course student will be able
CO1	Learn the basic notions of information and channel capacity.
CO2	Introduction to information theory, the fundamentals of error control coding techniques and their applications, and basic cryptography.
CO3	Understand how error control coding techniques are applied in communication systems.
CO4	To understand and knowledge of probabilities, entropy, measures and their application in information theory.
CO5	Understand convolutional and block codes, decoding techniques, and automatic repeat request (ARQ) scheme.

CO6	Apply coding techniques for error detection and correction.

Paper Name: Cyber Law and IPR Paper Code: BITCSC502

СО	Description: After the completion of the course student will be able
CO1	provide knowledge related to auditing of computer systems, managing and mitigating risk situations in the organization and techniques for investigating financial frauds.
CO2	create awareness on cybercrime & IT law.
CO3	Provide the assistance to handle cybercrime.
CO4	Learn and assess gender based cybercrime.
CO5	identify the emerging Cyber Laws, Cybercrime & Cyber security trends and jurisprudence impacting cyberspace in today's scenario.
CO6	enable the participants to appreciate, evaluate and interpret the case laws with reference to the IT Act and other Laws associated with cyberspace.

Paper Name: Cloud Computing Paper Code: BITCSC601

со	Description: After the completion of the course student will be able
CO1	To explore the working of open source and commercial cloud computing platforms.
CO2	Selection of a particular deployment model according to scenario.
CO3	To be able to implement various services on the cloud.
CO4	Design and develop cloud using various cloud platforms.
CO5	Explore the usage of cloud simulation tools and techniques.
CO6	Compare and contrast various open and commercial cloud platforms.

Paper Name: Biometric Security Paper Code: BITCSC602

со	Description: After the completion of the course student will be able
CO1	Demonstrate knowledge of the basic physical and biological science and engineering principles underlying biometric systems.
CO2	Understand and analyze biometric systems at the component level and be able to analyze and design basic biometric system applications.
CO3	Be able to work effectively in teams and express their work and ideas orally and in writing.
CO4	Identify the sociological and acceptance issues associated with the design and implementation of biometric systems.
CO5	Understand various Biometric security issues.

Paper Name: Cloud Computing Lab Paper Code: BITCSC691

со	Description: After the completion of the course student will be able
CO1	To explore the working of open source and commercial cloud computing platforms

CO2	Selection of a particular deployment model according to scenario.
CO3	To be able to implement various services on the cloud.
CO4	Design and develop cloud storage using various cloud platforms.
CO5	Explore the usage of cloud simulation tools and techniques.
CO6	Compare and learn about various open and commercial cloud platforms.

Program Name: B.Sc. in Food Science and Technology

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/BSCFST/AllSem20.pdf

Paper Name: Food Microbiology Paper Code: BSUFT-101

СО	Description: After the completion of the course student will be able
CO1	Recall the different types and morphology of microorganisms and magnification capacity of different types of microscopes.
CO2	Identify the factors affecting the growth in controlling the growth curve of microorganisms.
CO3	Analyze to preserve the perishable foods from different types of microbial spoilage.
CO4	Adapt the beneficial effects of microorganisms in the processing and development of fermented foods.

Paper Name: Food Microbiology Lab Paper Code: BSUFT-191

со	Description: After the completion of the course student will
	be able

CO1	Identify various instruments used in the Food Microbiology laboratory and to study the morphology and special characteristics of microorganisms with staining procedures.
CO2	Apply the knowledge of preparing culture media with aseptic inoculation techniques for microbial growth determination.
CO3	Analyze the bacterial growth curve.
CO4	Evaluate the occurrence of microorganisms in different food items and water samples qualitatively as well as quantitatively.

Paper Name: Food Chemistry Paper Code: BSUFT-102

со	Description: After the completion of the course student will be able
CO1	Demonstrate the properties and reactions of the various food components.
CO2	Apply the basic principles and properties of starch proteins, fats and oils, pectic substances and spices and condiments.
CO3	Develop products with minimum nutritional loss based on the knowledge of food chemistry.

CO4	Evaluate the food quality on the basis of knowledge of different nutrients present in food.
CO5	Design diet charts from the knowledge of different nutrients, calorific value and other health benefits.

Paper Name: Food Chemistry Lab Paper Code: BSUFT-192

СО	Description: After the completion of the course student will be able
CO1	Identify laboratory equipment and the safety & measures.
CO2	Examine different products through laboratory analysis / experiments.
CO3	Build himself / herself as a Food analyst / lab co-coordinator.

Paper Name: ENGLISH COMMUNICATION Paper Code: BSUFT-104

со	Description: After the completion of the course student will be able
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CO1	Recall English grammar correctly in order to make an error-free communication.
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CO2	Apply writing skill to set a positive impression for them.
CO3	Organize vocabulary and use them effectively and appropriately.
CO4	Take part in group discussion. By looking at various scenarios, a student will learn key language for group discussion as well as gain some business etiquette
CO5	Defend in the personal interview, job interview, or any kind of presentation.
CO6	Build the four language skills to communicate more effectively and properly.

Paper Name: Nutritional Biochemistry Paper Code: BSUFT-201

со	Description: After the completion of the course student will be able
CO1	Define the basics of biomolecules, their structures, relevant biochemical reactions and nutrition.

CO2	Explain the metabolism of different biomolecules and enzymatic pathways leading to end products.
CO3	Justify the structure, function and metabolism of vitamins, hormones and water.
CO4	Construct the concepts and functions of different enzymes and various coenzymes.

Paper Name: **Biochemistry Lab** Paper Code: **BSUFT-291**

со	Description: After the completion of the course student will be able
CO1	Construct the method of evaluation of different biomolecules like protein, carbohydrate, digestive enzymes, and vitamins.
CO2	Organize the tests for proteins, carbohydrates, digestive enzymes, and vitamins.
CO3	Determine the quantity of different metabolites in blood.
CO4	Estimate the quality of water.

Paper Name: Chemistry Paper Code: BSUFT-202

со	Description: After the completion of the course student will be able
CO1	Recall the fundamental theories and basic concepts of Thermodynamics, Dilute solutions, Colligative properties, Electrochemistry, Ionic Equilibrium, Reaction Mechanisms, chemistry of colloids and emulsions, the basics of nanotechnology and the chemistry of nanomaterial.
CO2	Explain the concepts of Thermodynamics, Dilute solutions, Colligative properties, Electrochemistry, Ionic Equilibrium, Reaction Mechanisms in food processing, food chemistry, quality control arenas.
CO3	Apply the concept of instrumental methods of spectral analysis and photochemistry.
CO4	Create emulsions and colloids for food related applications.

Paper Name: Chemistry Lab Paper Code: BSUFT-292

со	Description: After the completion of the course student will
	be able

CO1	Find the physical properties like surface tension, viscosity of materials.
CO2	Analyze the quality of water by hardness measurement and chloride content.
CO3	Develop the concept of acidimetry and alkalimetry and apply the same for determination of strength of acid or base.
CO4	Apply the concept of adsorption in thin layer chromatography.
CO5	Estimate the oxidation reduction titration for preparation of a primary standard and use the same to determine the strength of a secondary standard material.

Paper Name: Environmental Science Paper Code: BSUFT-204

со	Description: After the completion of the course student will be able
CO1	Recall knowledge on natural processes that sustain life, and govern the economy.
CO2	Explain the consequences of human actions on the web of life, global economy and quality of human life.

CO3	Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.
CO4	Apply the values and attitudes towards understanding complex environmental-economic social challenges, and participating actively in solving current environmental problems and preventing the future ones.
CO5	Adapt sustainability as a practice in life, society and industry.

Paper Name: Principles of Food Science & Technology Paper Code: BSUFT-301

со	Description: After the completion of the course student will be able
CO1	Define Food Science precisely to integrate knowledge from various fields applied to the study of the foods.
CO2	Identify the important pathogens, and spoilage microorganisms in foods and the conditions under which they will grow.
CO3	Apply modern technology viz. Hurdle Technology, Minimal processing for implementation in Food Processing and Food Engineering area.
CO4	Evaluate the Food and water quality, CIP system, and methods of Sanitization and sensory analysis.

Paper Name: Principles of Food Preservation & Food Product Development Paper Code: BSUFT-302

со	Description: After the completion of the course student will be able
CO1	Recall the knowledge to prevent food spoilage until it can be consumed.
CO2	Explain the Techniques of preservation by Thermal and non thermal methods.
CO3	Apply the preservation techniques by reduction of moisture% and water activity of food stuff.
CO4	Justify different processing methods for the increase of shelf-life of the processed food. Hence to develop new food products for betterment of society.

Paper Name: FOOD PRODUCT DEVELOPMENT LAB Paper Code: BSUFT-391

CO Description: After the completion of the be able

CO1	Define the importance of development of food products in our society.
CO2	Apply different processing methods to develop innovative food products for enrichment.
CO3	Estimate the quality parameters and sensory evaluation of new developed products.

Paper Name: Food Processing Technology-I (Fruits & Vegetables, & Beverages) Paper Code: BSUFT-303

со	Description: After the completion of the course student will be able
CO1	Recall fundamental knowledge about processing of fruits and vegetables to get a successful career in food processing industries especially in beverage industries.
CO2	Explain product formation with fruits and vegetables and their preservation techniques.
CO3	Apply basic knowledge about processing of spices and beverages.

Paper Name: Food Processing Technology- I(Fruits & Vegetables, & Beverages) Paper Code: BSUFT-392

со	Description: After the completion of the course student will be able
CO1	Test for the food quality and proximate analysis of fruit and vegetable based products.
CO2	Identification of adulterants in fruit and vegetable products.
CO3	Estimate the characteristics of dehydrated fruits and vegetables.

Paper Name: Food Plant Layout & Design Paper Code: BSUFT-305

со	Description: After the completion of the course student will be able
CO1	Recall ideas about the basic concepts of a food plant layout and design using the ISO, FCO & MCO requirements.
CO2	Demonstrate vivid understanding of the layout and design of a food plant with the provision of waste disposal and safety arrangements with special emphasis on bakery, fruits & vegetables and beverage processing.
CO3	Apply the aspects of the designing of a pilot & semi-commercial food plant using PERT & CPM.

CO4	Develop an idea about project engineering and gain knowledge about the selection of location, construction materials, and instruments and also
	about the specifications of the equipment and accessories used.

Paper Name: Food Processing Technology II (Milk & Dairy Products) Paper Code: BSUFT 401

со	Description: After the completion of the course student will be able
CO1	Demonstrate different Dairy products processing industries and to gather the knowledge on physical properties of liquid milk.
CO2	Identify nutrients viz.Carbohydrate (Lactose), Proteins, and Lipids, Enzymes etc. present in liquid milk.
CO3	Apply different processing techniques for development of milk products.
CO4	Build and analyze different products from milk maintaining quality parameters.

Paper Name: Food Processing Technology-II (Milk & Dairy Products) Paper Code: BSUFT-491

со	Description: After the completion of the course student will be able
CO1	Test the quality of milk at procurement.
CO2	Evaluate microbial quality and nutritional components of milk.
CO3	Develop innovative milk based products and their quality assessment.

Paper Name: Process Calculations and Thermodynamics Paper Code: BSUFT-402

СО	Description: After the completion of the course student will be able
CO1	Explain material balances on Module operations, energy balance and processes.
CO2	Recommend the use of enthalpy changes, heat of reaction, heat of solution and usage of psychometric chart.

CO3	Ability to estimate thermodynamic properties of substances in gas and liquid states.
CO4	Determine thermodynamic efficiency of various energy related processes and heat sensors.

Paper Name: Food Processing Technology- III (Cereals, Pulses and Oilseeds) Paper Code: BSUFT-403

со	Description: After the completion of the course student will be able
CO1	Define the importance of milling.
CO2	Differentiate between milling requirements of different cereals, pulses and oilseeds.
CO3	Apply the knowledge for commercially important products from oil seeds and pulses.
CO4	Compare between alcoholic and non-alcoholic beverages.

Paper Name: Food Processing Technology III Lab(Cereals, Pulses and Oilseeds) Paper Code: BSUFT-492

СО	Description: After the completion of the course student will be able
CO1	Estimate gluten content, wheat and rice cooking characteristics.
CO2	Identify good or bad quality of flour.
CO3	Formulate new cereal based food with enhanced nutritional value.

Paper Name: Plant Training Paper Code: BSUFT-405

со	Description: After the completion of the course student will be able
CO1	Identify different components of food science and technology, skills and scientific techniques followed in various food businesses/industries.
CO2	Relate between academia and ever changing demand driven industrial business scenario to develop the need of industry with the polarization paradigm.
CO3	Adopt basic industrial practices with ever changing food regulatory standards, ethics, legislation and food safety issues.

CO4	Apply the skills and knowledge required for a particular job function.
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Paper Name: Food Processing Technology –IV (Meat, Fish and Egg) Paper Code: BSUFT-501

со	Description: After the completion of the course student will be able
CO1	Recall about the meat and poultry industry in India.
CO2	Demonstrate animal slaughtering process and meat quality.
CO3	Apply Knowledge about fish processing and its bye products.
CO4	Analyze the methods of egg preservation and quality.

Paper Name: Food Processing Technology IV Lab (Meat, Fish and Egg) Paper Code: BSUFT-591

со	Description: After the completion of the course student will be able

CO1	Identify different postmortem changes.
CO2	Analyze the quality of Fish meat and poultry products.
CO3	Formulate innovative types of fish meat and poultry based products.

Paper Name: Instrumental Analysis of Food Paper Code: BSUFT-502

со	Description: After the completion of the course student will be able
CO1	Explain different categories of fluid moving devices used in various engineering applications.
CO2	Demonstrate heat transfer equipment and to categorize the technological methods related to heat transfer in the process plant.
CO3	Identifying a detailed overview of heat transfer equipment and problems associated at preliminary stages of design.
CO4	Distinguish temperature, pressure and flow measuring devices for industrial purposes as well as to set their control strategy.

Paper Name: Food Analysis Lab Paper Code: BSUFT-592

со	Description: After the completion of the course student will be able
CO1	Apply the knowledge of analytical & instrumental parts in Food analysis.
CO2	Develop himself/herself for analytical skills.
CO3	Analyze the different techniques he/she learnt from this part.
CO4	Create tests for food analysis and quality control.

Paper Name: Food Packaging Technology Paper Code: BSUFT-601

со	Description: After the completion of the course student will be able
CO1	Classify about the need of food packaging materials, the different types of materials used for various types of food packaging.

CO2	Apply sustainable solutions to packaging problems.
CO3	Analyze the physical, chemical, and functional properties of various food packaging materials along with safety, convenience, and environmental issues related to various packaging techniques.
CO4	Evaluate and build the technology behind food packaging machineries for effective designing of the food packaging materials.

Paper Name: Food Safety Standards, Adulteration & Food Laws Paper Code: BSUFT-602

со	Description: After the completion of the course student will be able
CO1	Summarise the Concept of hazards, food quality and safety.
CO2	Awareness about hygiene and sanitation in food manufacturing units.
CO3	Identify microbiological safety of foods.
CO4	Develop awareness of domestic and international food laws.

Program Name: B.Tech. in Information Technology

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/IT/AllSem22.pdf

со	Description: After the completion of the course student will be able
CO1	Basic concepts of mechanics
CO2	Bragg's Law and introduction to the principles of lasers, types of lasers and applications
CO3	Various terms related to properties of materials such as, permeability, polarization, etc.
CO4	Some of the basic laws related to quantum mechanics as well as magnetic and dielectric properties
CO5	Simple quantum and Statistical mechanics Calculation.

Paper Name: Physics-I Paper Code: BS-PH101

Paper Name: Mathematics-IA Paper Code: BS-M101

со	Description: After the completion of the course student will be able
CO1	Apply the concept and techniques of differential and integral calculus to determine curvature and evaluation of different types of improper integrals
CO2	Understand the domain of applications of mean value theorems to engineering problems.
CO3	Learn different types of matrices, concept of rank, methods of matrix inversion and their applications
CO4	Understand linear spaces, its basis and dimension with corresponding applications in the field of computer science
CO5	Learn and apply the concept of eigenvalues, eigen vectors, diagonalization of matrices and orthogonalization in inner product spaces for understanding physical and engineering problems.

Paper Name: Basic Electrical Engineering Paper Code: ES-EE101

со	Description: After the completion of the course student will be able
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CO1	Solve problems of different types of DC Circuits using different laws and theorems of DC circuits, Single and three phase AC circuits.
CO2	Calculate performance parameters like current, voltage, efficiency etc of Transformers using equivalent circuits and other concepts.
CO3	Explain the construction and working principles of Transformers, DC and AC Motors and Generators and solve numerical and conceptual problems regarding performance DC and AC Motors and Generators.
CO4	Explain working principles of different types of Power Electronic Converters.
CO5	Classify different types of wires and cable, and Batteries.
CO6	Explain working principles of different types of LT Switch Gears and Circuit Breakers, principles of Earthing, Battery Characteristics, Elementary calculations for energy consumptions and Power factor Improvement principles of Earthing, Battery Characteristics, Elementary calculations for energy consumptions and Power factor Improvement.

Paper Name: Physics-I Laboratory Paper Code: BS-PH191/ BS-PH291

со	Description: After the completion of the course student will be able
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CO1	Apply the various techniques and procedures for the Engineering Physics experiments
CO2	Use the different meters and measuring devices to record the data with precision
CO3	Apply the equations/mathematical concepts to obtain quantitative results
CO4	Develop basic communication skills through working in groups in performing the laboratory experiments.
CO5	Acquire skill for interpreting the results obtained from Laboratory experiments

Paper Name: Basic Electrical Engineering Laboratory Paper Code: ES-EE191

СО	Description: After the completion of the course student will be able
CO1	Use Electrical Elements and Measuring Instruments.
CO2	Measure Time Response of RLC Circuits and Resonance.

CO3	Analyze performance of Single Phase and three phase Transformer.
CO4	Evaluation of operation of (a) DC-DC converter (b) DC-AC converter (c) DC-AC converter for speed control of an Induction motor
CO5	Determination of Torque –Speed characteristics of separately excited DC motor and induction motor

Paper Name: Engineering Graphics & Design Paper Code: ES-ME191/ ES-ME 291

со	Description: After the completion of the course student will be able
CO1	Familiarize with the fundamentals and standards of Engineering graphics
CO2	Perform freehand sketching of basic geometrical constructions and multiple views of objects.
CO3	Project orthographic projections of lines and plane surfaces.

CO4	Draw projections and solids and development of surfaces.
CO5	Visualize and to project isometric and perspective sections of simple solids.
CO6	Ability to draw 2D & 3D Objects in Autocad.

Paper Name: Chemistry-I Laboratory Paper Code: BS-CH191/BS-CH291

со	Description: After the completion of the course student will be able
CO1	Analyze the requirement of equipment to be used for a particular experiment
CO2	Perform the titration experiments of acid & base using indicator using pH meter & conductivity meter.
CO3	Determination of hardness, dissolved oxygen & chloride ion in water.
CO4	Able to analyze a chemical salt, oil and check impurity.

CO5	Able to handle instruments.

Paper Name: Workshop/ Manufacturing Practices Paper Code: ES-ME192/ ES-ME 292

со	Description: After the completion of the course student will be able
CO1	Build thorough knowledge of various to ols, machines, devices used in engineering practice
CO2	Acquire thorough knowledge of carrying out various operations in mechanical engineering workshop
CO3	Utilize measuring skills gained in workshop practice
CO4	Acquire "Hands on" training and practice to students for use of various tools, devices and machines
CO5	Acquire skills in basic engineering practice for creating objects from raw materials

Paper Name: Chemistry-I

Paper Code: BS-CH201

со	Description: After the completion of the course student will be able
CO1	Analyze microscopic chemistry in terms of molecular orbital's and intermolecular forces
CO2	Rationalize bulk properties and processes using thermodynamic considerations
CO3	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
CO4	Rationalize periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity
CO5	List of the chemical reactions that are used in the synthesis of molecules.

Paper Name: Mathematics – II A Paper Code: BS-M201

со	Description: After the completion of the course student will be able

CO1	Familiar with the concept and techniques of probability and statistical theory
CO2	Understand the domain of applications of probability and statistical theory to engineering problems.
CO3	Learn different types of data analytic and data analysis methods through statistical theory
CO4	Apply statistical tools for analyzing data samples and drawing inference on a given data set.
CO5	Learn and apply several decision making method from large sample of data or such problem

Paper Name: Programming for Problem Solving Paper Code: ES-CS201

СО	Description: After the completion of the course student will be able
CO1	Identify the need and use of programming in real world environment
CO2	Illustrate the C data types, syntax and constructs.

CO3	Compare decision making, branching and looping statements
CO4	Explain the concept of Array, Pointer and Strings to solve different problems.
CO5	Develop the concepts of Function modules, their usage and memory allocation.
CO6	Classify the concepts of structures and unions: declaration, initialization and implementation.

Paper Name: English Paper Code: HM-HU201

со	Description: After the completion of the course student will be able
CO1	At the end of the course, students should be able to recall the basic tenses of English grammar
CO2	Students are able to form sentences for speaking.
CO3	The students should be able to test the skills which they have learnt such as the concepts of notetaking via lessons on Minutes of Meeting to real-life situations.

CO4	The students should be able to utilize assessments as well as in practical situations

Paper Name: Programming for Problem Solving Lab Paper Code: ES-CS291

СО	Description: After the completion of the course student will be able
CO1	Implement procedural language concepts.
CO2	Implement C data types, syntax and constructs
CO3	Implement decision making, branching and looping statements
CO4	Implement Function modules, their usage and memory allocation
CO5	Implement the concept of Array, Pointer and Strings to solve different problems.
CO6	Apply concepts of structures and unions: declaration, initialization and implementation.

Paper Name: Language Laboratory Paper Code: HM-HU291

со	Description: After the completion of the course student will be able
CO1	The students can modify their narratives/discourse in accordance to their requirement and individuality.
CO2	Recall the basic tenses of English conversation.
CO3	Relate the skill sets to be used for given situations.
CO4	Make use of the skill of listening in acquiring new knowledge.
CO5	Examine the skills which they have learnt in real-life situations.

Paper Name: Digital Electronics Paper Code: ESC-301

CO1	Compare between analog and digital systems.
CO2	Solve different types of codes and number systems which are used in digital communication and computer systems.
CO3	Analyze Boolean laws and K-map to simplify the digital circuits.
CO4	Apply the various digital Combinational circuits and their operation.
CO5	Apply the various digital Sequential Circuits and their operation.

Paper Name: Data Structure & Algorithm Paper Code: PCC-IT301

со	Description: After the completion of the course student will be able
CO1	Summarize the concept of data structure, data type and array data structure.

CO2	Implement linked list data structure to solve various problems.
CO3	Apply various data structures such as stacks, queues, trees and graphs to solve various computing problems using C-programming language.
CO4	Compare the standard algorithms for searching and sorting.
CO5	Evaluate the performance of an algorithm in terms of complexity using asymptotic notation.
CO6	Choose effectively the data structure that efficiently model the information in a problem.

Paper Name: Signals & Systems Paper Code: ESC302

со	Description: After the completion of the course student will be able
CO1	Classify the signals as Continuous time and Discrete time.
CO2	Analyze the spectral characteristics of signals using Fourier analysis

CO3	Classify systems based on their properties and determine the response of the LTI system using convolution.
CO4	Identify system properties based on impulse response and Fourier analysis.
CO5	Apply transform techniques to analyze continuous-time and discrete-time signals and systems.

Paper Name: Mathematics-III (Differential Calculus) Paper Code: BSC-301

со	Description: After the completion of the course student will be able
CO1	Distinguish between absolute and conditional convergence of series and be aware of the consequences of reordering terms in conditionally convergent series.
CO2	Apply partial derivatives for estimating maxima and minima of real- life multivariable functions.
CO3	Make use of double and triple integrals to find the volume of rectangular regions in the xyz-plane.
CO4	Understand the terms 'exponential growth/decay', 'proportionate growth rate' and 'doubling/halving time' in differential equation when applied to population models, and the terms 'exponential

	decay', 'decay constant' and 'half-life' in D.E when applied to radioactivity.
CO5	Analyze new networks using the main concepts of graph theory.

Paper Name: Biology Paper Code: BSC 302

СО	Description: After the completion of the course student will be able
CO1	Describe biological observations of the 18th century that lead to major discoveries.
CO2	Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical, and ecological.
CO3	Highlight the concepts of excessiveness and dominance during the passage of genetic material. Also identify DNA as a genetic material in the molecular basis of information transfer.
CO4	Convey all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine.
CO5	Classify enzymes and distinguish between the different mechanisms of enzyme action.

CO6	Identify and classify microorganisms.
C07	Apply thermodynamic principles to biological systems.

Paper Name: Digital Electronics Lab Paper Code: ESC-391

СО	Description: After the completion of the course student will be able
CO1	Implement the designing of BCD to seven segment displays.
CO2	Analyze the working functionality of Half adders and full Adders.
CO3	Analyze the working functionality of the subtractor.
CO4	Examine the procedures for the analysis and design of Multiplexers and demultiplexers.
CO5	Analyze the working functionality of the decoder.

CO6	Designing c registers.	f various	types	of	sequential	circuits	like	flip	flops,

Paper Name: Data Structure & Algorithm Lab Paper Code: PCC-IT391

СО	Description: After the completion of the course student will be able
CO1	Represent data for efficient processing using the fundamental concept of Data Structure.
CO2	Develop applications using the search algorithms and sorting algorithms based on their time complexities.
CO3	Develop applications using the concepts of linear data structure like stack, queue and Linked List for different requirements.
CO4	Implement non-linear data structures like trees and graphs.
CO5	Design the application using the data structure that efficiently models the information in a problem.

Paper Name: IT Workshop (SciLab/MATLAB/Python/R)

со	Description: After the completion of the course student will be able
CO1	Understanding the contributions of scripting languages.
CO2	Design real life problems and think creatively about solutions.
CO3	Apply a solution in a program using R/Matlab/Python.
CO4	Solve real life problems using advanced applications of mathematics, engineering, natural sciences.

Paper Name: Discrete Mathematics Paper Code: PCC-IT401

со	Description: After the completion of the course student will be able
CO1	Express a logic sentence in terms of predicates, quantifiers and logical connectives.
CO2	Derive the solution for a given problem using deductive logic and prove the solution based on logical inference.
CO3	Classify its algebraic structure for a given mathematical problem.
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CO4	Evaluate Boolean functions and simplify expressions using the properties of Boolean Algebra.
CO5	Develop the given problem as graph networks and solve them with techniques of graph theory.

Paper Name: Computer Organization & Architecture Paper Code: PCC-IT402

СО	Description: After the completion of the course student will be able
CO1	To learn the Concept of a Computer System and Design methodology of Processor Design.
CO2	To learn Data path Design (Design of Adder, Subtractor, multiplier etc. and advanced ALU)
CO3	To learn the design of a hardwired control unit, micro programmed and nano-programmed Control unit.
CO4	To learn the concept of RISC & CISC processors, Harvard Architecture.

CO5	To learn Memory Technology & design various types of memory units and memory Organization.
CO6	To learn the concept of Performance Enhancement of Processor by Pipelining.
C07	FPG Architecture, design and concept of Reconfigurable Architecture.

Paper Name: Formal Language & Automata Theory Paper Code: PCC-IT403

со	Description: After the completion of the course student will be able
CO1	Define the mathematical principles behind theoretical computer science.
CO2	Illustrate for the different types of automata like finite automata, push down automata, linear bounded automata and Turing machine.
CO3	Correlate the different types of automata to real world applications.
CO4	Design appropriate automata for the different requirements outlined by theoretical computer science.

CO5	Identify the different computational problems and their associated complexity.

Paper Name: Communication Engineering Paper Code: PCC-IT404

СО	Description: After the completion of the course student will be able
CO1	To understand the fundamentals of radio communication system and analog modulation and demodulation techniques applying the basic knowledge of signals and systems and will be able to understand the concept of Frequency modulation.
CO2	To apply the basic knowledge of electronic circuits and understands the effect of Noise in communication system and noise performance of AM & FM systems
CO3	To understand TDM and Pulse Modulation techniques and baseband transmission schemes
CO4	To apply the knowledge of statistical theory of communication and signals and system and to explain and evaluate the performance of digital communication system in the presence of noise
CO5	To describe and analyze the digital communication system with spread spectrum modulation.

CO6	To design as well as conduct experiments, analyze and interpret the results to provide valid conclusions for analog & digital modulators and demodulators using hardware components and communication systems using CAD tools.

Paper Name: Economics for Engineers (Humanities-II) Paper Code: HSMC-401

СО	Description: After the completion of the course student will be able
CO1	Knowledge of Basic and its Global Application.
CO2	Grasping the perceptions of all basic economic concepts.
CO3	Applications of Concepts of Economics in various fields of Studies.
CO4	Understanding the concepts and its applications in Micro Economics.
CO5	Economical advances and its applications.

CO6 Advanced applications and future trending in Economics.	CO6	Advanced applications and future trending in Economics.
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Paper Name: Environmental Sciences Paper Code: MC-401

со	Description: After the completion of the course student will be able
CO1	describe the natural environment and its relationships with human activities.
CO2	learn fundamental Knowledge of science and engineering to assess environmental and health risk.
CO3	develop guidelines and procedures for health and safety issues obeying environmental laws and regulations.
CO4	acquire skills for scientific problem-solving related to air, water, noise & land pollution.
CO5	gain knowledge on how to perform EIA, Environmental Audit to assess the impact and further development.

Paper Name: Computer Organization & Architecture Lab

со	Description: After the completion of the course student will be able
CO1	To learn the Concept of a Computer System and Design methodology of Processor Design.
CO2	To learn Datapath Design (Design of Adder, Subtractor, multiplier etc. and advanced ALU)
CO3	To learn the design of a hardwired control unit, micro programmed and nano-programmed Control unit.
CO4	To learn the concept of RISC & CISC processors, Harvard Architecture.
CO5	To learn Memory Technology & design various types of memory units and memory Organization.
CO6	To learn the concept of Performance Enhancement of Processors by Pipelining.
C07	FPG Architecture, design and concept of Reconfigurable Architecture.

Paper Name: Communication Engineering Lab

со	Description: After the completion of the course student will be able
CO1	Understand the generation of AM signals and its performance.
CO2	Study the amplitude demodulation techniques.
CO3	Understand the generation of FM signals and its performance.
CO4	Study the frequency demodulation techniques.
CO5	Perform signal sampling by determining the sampling rates for baseband signals & to generate digital modulation signals for PAM.
CO6	Understand the generation of PWM & PPM schemes and estimate their output performance.

Paper Name: Design Analysis & Algorithms Paper Code: PCC-IT501

со	Description: After the completion of the course student will be able
CO1	Define the Significance of Algorithm, its applications and how to formulate and solve complex engineering problems related to Computer Science and Engineering.
CO2	Explain the mathematical expressions to prove asymptotic bounds for time complexity and use asymptotic notation to formulate the time and space requirements of complex problems.
CO3	Choose the fundamental techniques to design the algorithms efficiently. Understanding of basic recursive problems, finding recurrence relations and solved sorting problems (quick sort and merge sort) by divide and conquer approach
CO4	Analyze the time complexity of different algorithms and Define dynamic programming approach and build solutions for the optimization problems like chain matrix multiplication, all pair shortest path etc. Analyze the concept of greedy technique and apply it to solve the problems like single pair shortest path, minimum spanning tree using two popular method- prim's algorithm and kruskal algorithm
CO5	Explain the back tracking methodology and develop 8 Queens problem and graph coloring problem using it, also develop branch-and-bound algorithms

Paper Name: Database Management System (DBMS) Paper Code: PCC-IT502

со	Description: After the completion of the course student will be able
CO1	Illustrate the different components of database and data model
CO2	Design the databases using E R method and normalization for a given specification of the requirement
CO3	Construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2
CO4	Optimize query execution using Query optimization algorithms
CO5	Determine the transaction atomicity, consistency, isolation, and durability for a given transaction processing system
CO6	Justify the ACID property based on locking, time stamping algorithm on concurrency control and Serializability of scheduling.

Paper Name: Operating Systems (OS) Paper Code: PCC-IT503

СО	Description: After the completion of the course student will be able
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CO1	Explain the structure of different operating systems and different functionalities of it
CO2	Identify process, thread, the communication between application programs and hardware devices through system calls.
CO3	Analyze and CPU scheduling algorithm. Inspect process synchronization and its consequences.
CO4	Inspect process synchronization and deadlock.
CO5	Apply different memory management schemes.
CO6	Analyze different file systems, I/O devices, disk scheduling and different security vulnerabilities.

Paper Name: Object Oriented Programming withPython Paper Code: PCC-IT504

СО	Description: After the completion of the course student will be able
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CO1	Analyze the drawbacks of Procedure Oriented Programming compared with the concepts of Object Oriented Programming paradigm.
CO2	Identify the role of Classes & Objects, constructors & destructors in program design.
CO3	Design various forms of inheritance and class constructors are called.
CO4	Evaluate operator overloading, runtime polymorphism Programming through examples.
CO5	Explore exception handling and various Stream classes, I/O operations in handling file operations.

Paper Name: Introduction to Industrial Management (Humanities III) Paper Code: HSMC-501

СО	Description: After the completion of the course student will be able
CO1	Understand the Genesis of Industrial Engineering and Management (IEM).
CO2	Understand the linkage between IEM and Operations Management (OM).

CO3	Understand applications of OM
CO4	Applications of Optimization Principles.
CO5	Applications of Principles of IEM in Industry.
CO6	Justification and controlling of improvements and applications in industry.

Paper Name: Constitution of India Paper Code: MC-IT501A

со	Description: After the completion of the course student will be able
CO1	Identify and explore the basic features and modalities about the Indian constitution.
CO2	Differentiate and relate the functioning of the Indian parliamentary system at the center and state level.
CO3	Differentiate different aspects of the Indian Legal System and its related bodies.

CO4	Discover and apply different laws and regulations related to engineering practices.
CO5	Correlate role of engineers with different organizations and governance models

Paper Name: Essence of Indian Knowledge Tradition Paper Code: MC-IT501B

со	Description: After the completion of the course student will be able
CO1	Identify the concept of Traditional knowledge and its importance
CO2	Explain the need and importance of protecting traditional knowledge.
CO3	Illustrate the various enactments related to the protection of traditional knowledge.
CO4	Interpret the concepts of Intellectual property to protect the traditional knowledge.
CO5	Explain the importance of Traditional knowledge in Agriculture and Medicine

Paper Name: Design Analysis & Algorithm Lab Paper Code: PCC-IT591

со	Description: After the completion of the course student will be able
CO1	Solve some problems using recursion.
CO2	Develop searching algorithms and sorting algorithms.
CO3	Represent Tree & Graphs and solve Bin Packing & TSP.
CO4	Implement KMP, BFS and DFS algorithms
CO5	Estimate the minimum cost of spanning tree, minimum cost of any two nodes of a graph, etc.

Paper Name: Database Management System Lab Paper Code: PCC-IT592

со	Description: After the completion of the course student will be able
CO1	Illustrate different types of SQL commands
CO2	Formulate queries using SQL operators
CO3	Apply different types of joining operation on multiple tables
CO4	Implement various queries using different functions and elaborate nested queries
CO5	Construct Views
CO6	Describe the concept of cursor and triggers

Paper Name: Operating System Lab Paper Code: PCC-IT593

со	Description: After the completion of the course student will be able
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CO1	Understand the fundamental concept of shell script.
CO2	Apply the concept of Array in shell script
CO3	Apply the concepts of operators in shell script
CO4	Apply the concepts of loop in shell script
CO5	Apply the concepts of string in shell script
CO6	Apply the concepts of function in shell script

Paper Name: Object Oriented Programming with Python Lab Paper Code: PCC-IT594

со	Description: After the completion of the course student will be able
CO1	Develop algorithmic solutions to simple computational problems.

CO2	Demonstrate programs using simple Python statements and expressions.
CO3	Design various forms of inheritance and analyze how base class constructors are called.
CO4	Evaluate operator overloading, runtime polymorphism Programming through examples.
CO5	Explain files, exceptions, modules and packages in Python for solving problems.

Paper Name: Software Engineering Paper Code: PCC-IT601

со	Description: After the completion of the course student will be able
CO1	Identify software Engineering problem specification, performance, maintenance and quality requirements
CO2	Select modern engineering tools necessary for software project management, time management and software reuse.
CO3	Analyze, elicit and specify software requirements through a productive working relationship with various stakeholders of the project.

CO4	Distinguish different testing strategies and it's working.
CO5	Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
CO6	Develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice.

Paper Name: Computer Networks Paper Code: PCC-IT602

СО	Description: After the completion of the course student will be able
CO1	Explain the basics of computer networking, different network model and architecture
CO2	Analyze different networking functions and features for identifying optimal solutions
CO3	Apply different networking concepts for implementing network solution
CO4	Evaluate and implement routing algorithms for implanting solution for the real life problems

CO5	Develop implement model of fault tolerant computer networks

Paper Name: Software Engineering Lab Paper Code: PCC-IT691

СО	Description: After the completion of the course student will be able
CO1	To handle software development models through rational method.
CO2	To prepare SRS document, design document, test cases and software configuration management and risk management related document
CO3	To Develop function oriented and object oriented software design using tools like rational rose.
CO4	To perform unit testing and integration testing.
CO5	To apply various white box and black box testing techniques.
CO6	Able to Plan a software engineering process life cycle.

Paper Name: Computer Networking Lab Paper Code: PEC-IT692

СО	Description: After the completion of the course student will be able
CO1	Understanding of network simulation tool
CO2	Ability to understanding the networking device, network command and configuration
CO3	Ability to simulate network topology using packet tracer software
CO4	The ability to do socket programming

Paper Name: Internet & Web Technology Paper Code: PCC-IT701

со	Description: After the completion of the course student will be able
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CO1	Define the principle of Internetworking, TCP/IP protocols, World Wide Web, client-server architecture, IP addressing, routing etc.
CO2	Explain the need for secured web application development with client-side, server-side scripting languages.
CO3	Construct web programs using the web languagesHTML, XML, JavaScript, Applet, Perl, etc.
CO4	Design and Develop small interactive websites using modern tools following the professional web based engineering solutions, ethics and management techniques.
CO5	Explain the advanced technologies like network security, multimedia applications, search engine, web crawler, etc with the websites.

Paper Name: Management 1 (Organizational Behavior) Paper Code: HSMC-IT701

со	Description: After the completion of the course student will be able
CO1	Describe organizational behavior and differentiate between the three levels of influence
CO2	Discuss the impact that diversity of race, gender, ability, religion, and age has on the workplace

CO3	Recognize the importance of recognizing and valuing individuals' differences
CO4	Explain the importance of managing stress and emotions in the workplace
CO5	Identify common organizational structures and the advantages and disadvantages of each

Paper Name: Internet & Web Technology Lab Paper Code: PCC-IT791

со	Description: After the completion of the course student will be able
CO1	Explain internet development techniques and Protocols leading Web.
CO2	Understand the different approaches in network security models.
CO3	Design different web pages using HTML, XML, CSS, JavaScript, and Java applet

CO4	Create client-server model using socket programming techniques
CO5	Develop interactive internet/web applications based on Servlets and JSP

Paper Name: Information Security Paper Code: PCC-IT801

со	Description: After the completion of the course student will be able
CO1	Examine and apply the fundamental techniques of computer security
CO2	Identify and explain risk and potential security issues
CO3	Demonstrate responsible computer use as it deals with social, political, legal and ethical issues in today's electronic society
CO4	Demonstrate knowledge of the profession, its organizations, goals and leadership roles, Literature/publications, issues, and research foundations.
CO5	Demonstrate knowledge of security objectives and policy development

CO6	Plan	for	the	future	and	design	a	solutior	n based	l on	user
	requir	eme	nts.	Explain	busi	ness co	Intinu	uity, ba	ckup an	Id dis	saster
	recov suppo	ery. ort	Uno	derstand	d tro	ubleshoo	oting	and	quality	cons	sumer

Program Name: M.Tech Geoinformatics

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MTECHGI/AllSem20.pdf

Paper Name: Principles of Remote Sensing and Photogrammetry Paper Code: PGGI-101

СО	Description: After the completion of the course student will be able
CO1	To recall the basic concepts and fundamentals of Physics of Remote Sensing
CO2	To design a firm basis for successful integration of Remote Sensing in any field of application.
CO3	Express detailed, integrated knowledge of the application and history of Remote Sensing
CO4	Discuss the nature of ElectroMagnetic Radiation and its interaction with the earth's surface and atmosphere
CO5	Identify a critical understanding of the differences between Remote Sensing systems and be aware of their characteristics and limitations
CO6	Apply knowledge of image processing principles strategically to new problems

Paper Name: Principles of Geographic Information Systems (GIS) Paper Code: PGGI-102

со	Description: After the completion of the course student will be able
CO1	Identify the components and a range of the methods which make up Geographical Information Systems and the field of Geographical Information Science
CO2	Illustrate knowledge of the multifarious data sources commonly used in GIS, and critically discuss the importance of data modeling in the storage of such data
CO3	Extrapolate the functionality of the ArcGIS software, including basic expertise in analysis, classification, query and integration of vector and raster data and its visualization
CO4	Perform appropriate cartographic principles in the construction of maps (including an appreciation of map projections)
CO5	Formulate an integrated practical project, drawing on appropriate source data, providing meaningful analysis, effective visualization of output and drawing appropriate conclusions which demonstrate professional level insight

Paper Name: Basics of GNSS, Cartography & Digital Mapping Paper Code: PGGI-103

со	Description: After the completion of the course student will be able
CO1	Explain the conceptual and technical understanding of GIS and GNSS

CO2	Compose students for Spatial Data Analysis and Modelling
CO3	Describe the basic components of Remote Sensing
CO4	Students may able to develop knowledge of the Sensor characteristics of various RS Systems
CO5	Acquire knowledge of different missions & their utility

Paper Name: Mathematical Methods and Scientific Computing for Geospatial Data Analysis Paper Code: PGGI-104

СО	Description: After the completion of the course student will be able
CO1	Familiar with the ideas of Mathematical Modelling and describe the utility of Mathematical Modelling to recognize the natural phenomena
CO2	Able to formulate a Mathematical Model that represents the dynamics of a natural system and use appropriate methods to obtain solutions
CO3	Able to gain insight into a natural system through the application of Mathematical Modelling techniques

CO4	Recognise how Mathematical methods learned at earlier levels may be used to model natural systems.

Paper Name: Recent Trends in Geo-informatics:Machine Learning and Big Data Paper Code: PGGI-105

со	Description: After the completion of the course student will be able
CO1	Understand the concept of a coupled Land-Atmosphere-Ocean as a whole system.
CO2	Explain basic Geology and identify Geomorphological and Geological phenomena
CO3	Understanding of landscape evolution and environmental planning
CO4	Describe the composition of atmosphere, Atmospheric parameters, dynamics and thermodynamics
CO5	Summarize the fundamentals of Oceanography

CO6	Outline the various aspects of climate change, biosphere and ecosystem components

Paper Name: Audit Course Paper Code: PGGI-106

со	Description: After the completion of the course student will be able
CO1	Summarize human values, their significance and role in life.
CO2	Promote self-reflection and critical inquiry that foster critical thinking of one's value and the values of others.
CO3	Familiarized with various living and nonliving organisms and their interaction with environment
CO4	Discuss the basics regarding leadership and to become a conscious professional.

Paper Name: Remote Sensing and Photogrammetry Lab Paper Code: PGGI-191

со	Description: After the completion of the course student will be able
CO1	To recall the basic concepts and fundamentals of Physics of Remote Sensing
CO2	Design a firm basis for successful integration of Remote Sensing in any field of application.
CO3	Discuss the interaction of ElectroMagnetic Radiation with the Earth's surface and Atmosphere
CO4	Identify a critical understanding of the differences between Remote Sensing systems and be aware of their characteristics and limitations
CO5	Strategically apply the knowledge of Digital Image Processing to new problems

Paper Name: GIS Lab Paper Code: PGGI-192

со	Description: After the completion of the course student will be able
CO1	Identify the components and a range of methods for Geographical Information Systems and the field of Geographical Information Science

CO2	Illustrate knowledge of the multifarious data sources commonly used in GIS, and critically discuss the importance of data modeling in the storage of such data
CO3	Extrapolate the functionality of ArcGIS software, classification, query and integration of Topological data and its visualization
CO4	Perform appropriate Cartographic Projections in the construction of maps
CO5	Formulate an integrated practical project, providing meaningful analysis, effective visualization of output and drawing appropriate conclusions which demonstrate professional level insight

Paper Name: GNSS and Cartography Lab Paper Code: PGGI-193

со	Description: After the completion of the course student will be able
CO1	Explain the conceptual and technical understanding of GIS and GNSS
CO2	Compose students for Spatial Data Analysis and Modelling

CO3	Describe the basic components of Remote Sensing
CO4	Students may able to develop knowledge of the Sensor characteristics of various RS Systems
CO5	Acquire knowledge of different missions & their utility

Paper Name: Web Technology Lab Paper Code: PGGI-194

со	Description: After the completion of the course student will be able
CO1	Able to analyze a Web page and identify its elements and attributes.
CO2	Design web pages using HTML and Cascading Style Sheets.
CO3	Build dynamic web pages using JavaScript.
CO4	Review and publish Spatial Dataset in Geoserver.

CO5	Discuss the Client Server Architecture of Geospatial Services.
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Paper Name: Programming in Python Paper Code: PGGI-195

со	Description: After the completion of the course student will be able
CO1	Explain basic principles of Python programming language
CO2	Implement object oriented concepts
CO3	Implement database and GUI applications

Paper Name: Spatial Data Modeling Paper Code: PGGI-201

СО	Description: After the completion of the course student will be able
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CO1	Discuss the main methods for storing and encoding Geospatial information in Computer Systems
CO2	Explain the basics of Relational Databases and SQL
CO3	Be able to implement these principles using the ORACLE RDBMS and ArcGIS.
CO4	Be able to undertake individual and group practical work, and write assignments within the specified parameters and to a professional standard
CO5	Describe the principal spatial data types and be familiar with a variety of methods of spatial analysis as applicable to each.

Paper Name: Satellite Image Processing Paper Code: PGGI-202

со	Description: After the completion of the course student will be able
CO1	Gain knowledge of basic concepts of remote sensing.
CO2	Gain knowledge of applications of different satellite imagery, image classification techniques and image analysis and interpretation.

Paper Name: Audit Course Paper Code: PGGI-205

со	Description: After the completion of the course student will be able
CO1	Understood human values, their significance and role in life.
CO2	Promote self-reflection and critical inquiry that foster critical thinking of one's value and the values of others.
CO3	Familiarized with various living and nonliving organisms and their interaction with environment
CO4	Understood the basics regarding leadership and to become a conscious professional.

Paper Name: Research Methodology and IPR Paper Code: PGGI-206

СО	Description: After the completion of the course student will be able
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CO1	Identify the research problem and research process.
CO2	Discuss research ethics .
CO3	Prepare a well-structured research paper and scientific presentations
CO4	Explore various IPR components and process of filing.
CO5	Summarize the adequate knowledge on patent and rights

Paper Name: Database Analysis Lab Paper Code: PGGI-291

со	Description: After the completion of the course student will be able
CO1	Apply the main methods for storing and encoding Geospatial information in Computer Systems
CO2	Explain the basics of Relational Databases and SQL
CO3	Able to implement these principles using the ORACLE RDBMS and ArcGIS.
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CO4	Able to undertake individual and group practical work, and write assignments within the specified parameters and to a professional standard
CO5	Describe the main spatial data types and be familiar with a variety of methods of spatial analysis as applicable to each.

Paper Name: Satellite Image Processing Lab Paper Code: PGGI-292

со	Description: After the completion of the course student will be able
CO1	Gain knowledge of basic concepts of Remote Sensing.
CO2	Gain knowledge of applications of different satellite imagery, image classification techniques and image analysis and interpretation.

Programme Name: M.Tech. Information Technology(Data Science) Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MTECHITDS/AIISem20.pdf

Paper Name: Mathematical foundations of Computer Science Paper Code: PGIT(DS)101

СО	Description: After the completion of the course student will be able
CO1	To Know how to represent various statements using quantifiers, relations, functions, permutations and combinations, groups, graphs and trees
CO2	To understand the basic notions of discrete and continuous probability
CO3	To understand the methods of statistical inference, and the role that sampling distributions play in those methods
CO4	To perform correct and meaningful statistical analyses of simple to moderate complexity.
CO5	To apply mathematical logic to solve problems, pigeonhole principle to solve real time problems

Paper Name: Advanced Data Structures Paper Code: PGIT(DS)102

CO1	Understand the implementation of symbol tables using hashing techniques.
CO2	Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
CO3	Develop algorithms for text processing applications
CO4	Identify suitable data structures and develop algorithms for computational geometry problems

Paper Name: Research Methodology and IPR Paper Code: PGIT(DS)105

СО	Description: After the completion of the course student will be able
CO1	Understand research problem formulation.
CO2	Analyze research related information
CO3	Follow research ethics

CO4	Understand that today's world is controlled by Computer, Information Technology, but tomorrow's world will be ruled by ideas, concepts, and creativity.
CO5	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular
CO6	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits

Paper Name: English for research paper writing Paper Code: PGIT(DS)106A

со	Description: After the completion of the course student will be able
CO1	Understand that how to improve your writing skills and level of readability
CO2	Learn about what to write in each section
CO3	Understand the skills needed when writing a Title Ensure the good quality of paper at very first time submission

Paper Name: Disaster management Paper Code: PGIT(DS)106B

со	Description: After the completion of the course student will be able
CO1	learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO2	critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives
CO3	develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO4	critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Paper Name: Sanskrit for technical knowledge Paper Code: PGIT(DS)106C

со	Description: After the completion of the course student will be able
CO1	To get a working knowledge in illustrious Sanskrit, the scientific language in the world
CO2	Learning of Sanskrit to improve brain functioning

CO3	Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
CO4	The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Paper Name: Value education Paper Code: PGIT(DS)106D

СО	Description: After the completion of the course student will be able
CO1	Understand value of education and self- development
CO2	Imbibe good values in students
CO3	Let the should know about the importance of character

Paper Name: Advanced Data Structures Lab Paper Code: PGIT(DS)192

со	Description: After the completion of the course student will be able

CO1	Implement List ADTs and their operations.
CO2	Develop programs for sorting.
CO3	Develop programs for implementing trees and their traversal operations.
CO4	Implement graph traversal algorithms.
CO5	Apply algorithm design techniques.

Paper Name: Advanced Computer Architecture Paper Code: PGIT(DS)201

со	Description: After the completion of the course student will be able
CO1	Understand the micro-architectural design of processors
CO2	Learn about the various techniques used to obtain performance improvement and power savings in current processors

Paper Name: Advanced Database Paper Code: PGIT(DS)202

со	Description: After the completion of the course student will be able
CO1	For a given query, write relational algebra expressions for that query and optimize the developed expressions
CO2	For a given specification of the requirement, design the databases and normalization
CO3	For a given transaction-processing system, realization of the concurrency control and recovery management protocols
CO4	Understand distributed database systems architecture and design with knowledge of transparency, replication, and types of DDBMS - homogeneous and heterogeneous DDBMS
CO5	Understand the broad concepts of distributed transaction processing with distributed deadlock and distributed concurrency control protocols
CO6	Gain introductory idea about Oracle RDBMS

Paper Name: Constitution of India Paper Code: PGIT(DS)205A

со	Description: After the completion of the course student will be able
CO1	Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective
CO2	To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
CO3	To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Paper Name: Pedagogy Studies Paper Code: PGIT(DS)205B

СО	Description: After the completion of the course student will be able
CO1	Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
CO2	Identify critical evidence gaps to guide the development.

Paper Name: Stress management by Yoga Paper Code: PGIT(DS)205C

со	Description: After the completion of the course student will be able
CO1	To achieve overall health of body and mind
CO2	To overcome stress

Paper Name: Personality development through life enlightenment skills Paper Code: PGIT(DS)205D

со	Description: After the completion of the course student will be able
CO1	To learn to achieve the highest goal happily
CO2	To become a person with stable mind, pleasing personality and determination
CO3	To awaken wisdom in students

Paper Name: Advanced Computer Architecture Lab Paper Code: PGIT(DS)291

со	Description: After the completion of the course student will be able
CO1	To make students know about the Parallelism concepts in Programming
CO2	To give the students an elaborate idea about the different memory systems and buses
CO3	To introduce the advanced processor architectures to the students.
CO4	To make the students know about the importance of multiprocessors and multicomputers.
CO5	To study about data flow computer architectures

Paper Name: Advanced Database Lab Paper Code: PGIT(DS)292

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со	Description: After the completion of the course student will be able
	be able

CO1	Design, develop and implement a mid-scale relational database for an application domain using a commercial-grade RDBMS
CO2	Identify and resolve physical database design and implementation issues
CO3	Use the persistence framework of a chosen language to perform Object Relational Mapping
CO4	Research, analyze and use emerging technologies such as Big Data, NoSQL, On-Line Analytical Processing (OLAP) and Data Warehouses
CO5	Have hands-on experience with a number of contemporary information management systems
CO6	Explore a research aspect of advanced databases

Programme Name: M.Tech. in Information Technology Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MTECHIT/AIISem.pdf

Paper Name: Mathematical foundations of Computer Science Paper Code: PGIT 101

СО	Description: After the completion of the course student will be able
CO1	Ability to apply mathematical logic to solve problems.
CO2	Understand sets, relations, functions, and discrete structures.
CO3	Able to use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, and functions.
CO4	Able to formulate problems and solve recurrence relations.
CO5	Apply the concept of two dimensional random variables to correlation, regression and Central limit theorem
CO6	Able to model and solve real-world problems using graphs and trees.

Paper Name: Advanced Data Structures Paper Code: PGIT102

со	Description: After the completion of the course student will be able
CO1	Design and analyze programming problem statements
CO2	Understand the implementation and complexity analysis of fundamental and algorithms
CO3	Understand the implementation of symbol table using hashing techniques
CO4	Be able to understand and analyze some fundamental data structures, such as binary search trees, d1s101nt sets, and self-adjusting lists
CO5	Have been exposed to algorithmic issues in a variety of areas, including linear programming and game-theory
CO6	Identify suitable data structures and develop algorithms for computational geometry problems

Paper Name: Research Methodology and IPR Paper Code: PGIT 105

со	Description: After the completion of the course student will be able

CO1	Understand research problem formulation.
CO2	Analyze research related information
CO3	Follow research ethics
CO4	Understand that today's world is controlled by Computer, Information Technology, but tomorrow's world will be ruled by ideas, concepts, and creativity.
CO5	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular
CO6	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits

Paper Name: English for research paper writing Paper Code: PGIT-106A

со	Description: After the completion of the course student will
	be able

CO1	Understand that how to improve your writing skills and level of readability
CO2	Learn about what to write in each section
CO3	Understand the skills needed when writing a Title Ensure the good quality of paper at very first time submission

Paper Name: Disaster management Paper Code: PGIT-106B

СО	Description: After the completion of the course student will be able
CO1	learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO2	critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives
CO3	develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO4	critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different

countries, particularly their home country or the countries they work in

Paper Name: Sanskrit for technical knowledge Paper Code: PGIT-106C

со	Description: After the completion of the course student will be able
CO1	To get a working knowledge in illustrious Sanskrit, the scientific language in the world
CO2	Learning of Sanskrit to improve brain functioning
CO3	Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
CO4	The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Paper Name: Value education Paper Code: PGIT-106D

со	Description: After the completion of the course student will
	be able

CO1	Understand value of education and self- development
CO2	Imbibe good values in students
CO3	Let the should know about the importance of character

Paper Name: Advanced Data Structures Lab Paper Code: PGIT-192

со	Description: After the completion of the course student will be able
CO1	Implement List ADTs and their operations.
CO2	Develop programs for sorting.
CO3	Develop programs for implementing trees and their traversal operations.
CO4	Implement graph traversal algorithms.

CO5	Apply algorithm design techniques.

Paper Name: Advanced Computer Architecture Paper Code: PGIT-201

со	Description: After the completion of the course student will be able
CO1	Understand the state-of—the-art in computer architectures and processing.
CO2	Determine the key architectural elements to improve the performance of a computer system
CO3	Understand the Instruction Level Parallelism and the techniques to handle control hazards
CO4	Interpret performance of different pipelined processors
CO5	Understand the Data Flow Architecture for exploiting parallelism
CO6	Design Memory Hierarchy for improving performance of computer system

Paper Name: Advanced Operating System Paper Code: PGIT-202

со	Description: After the completion of the course student will be able
CO1	Explain the structure of different operating systems and different functionalities of it.
CO2	Identify process ,thread , the communication between application programs and hardware dev1ces through system calls.
CO3	Analyze and CPU scheduling algorithm. Inspect process synchronization and its consequences.
CO4	Inspect process synchronization and deadlock.
CO5	Apply different memory management scheme
CO6	Analyze different file systems, I/O dev1ces, dISk scheduling and different security vulnerabilities.

Paper Name: Constitution of India Paper Code: PGIT-205A

со	Description: After the completion of the course student will be able
CO1	Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective
CO2	To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
CO3	To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Paper Name: Pedagogy Studies Paper Code: PGIT-205B

со	Description: After the completion of the course student will be able
CO1	Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
CO2	Identify critical evidence gaps to guide the development.

Paper Name: Stress management by Yoga Paper Code: PGIT-205C

со	Description: After the completion of the course student will be able
CO1	To achieve overall health of body and mind
CO2	To overcome stress

Paper Name: Personality development through life enlightenment skills Paper Code: PGIT-205D

со	Description: After the completion of the course student will be able
CO1	To learn to achieve the highest goal happily
CO2	To become a person with stable mind, pleasing personality and determination
CO3	To awaken wisdom in students

Paper Name: Advanced Computer Architecture Lab Paper Code: PGIT-291

со	Description: After the completion of the course student will be able
CO1	To make students know about the Parallelism concepts in Programming
CO2	To give the students an elaborate idea about the different memory systems and buses
CO3	To introduce the advanced processor architectures to the students.
CO4	To make the students know about the importance of multiprocessors and multicomputers.
CO5	To study about data flow computer architectures

Paper Name: Advanced Operating System Lab Paper Code: PGIT-292

со	Description: After the completion of the course student will be able

CO1	Identify the role of the Operating System. To understand the design of the control unit.
CO2	Understanding the performance trade-offs in developing high-performance low-level OS code. Specifically:
	 The influence of cache architecture on OS design. The influence of cache coherence models and multicore on OS and sync primitive design and implementation. The influence of execution models on complexity and performance of OS code.
CO3	Developing benchmarks to evaluate the performance of OSs and application stacks

Programme Name: M.Sc. in IT(Cyber Security) Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MSCITCS/AllSem20.pdf

Paper Name: Discrete Mathematics of Computer Science Paper Code: MITCS101

СО	Description: After the completion of the course student will be able
CO1	Apply mathematical and computing knowledge.
CO2	Assess current technology and future trends in computer science.
CO3	Problem solve through modeling of real world phenomena using mathematics and computing
CO4	Importance of mathematics and computer science research questions from a perspective consistent with the norms of the field.
CO5	Interpret mathematical and computing knowledge
CO6	Translate mathematical concepts to computing domain.

Paper Name: Advanced Data Structures and Algorithms Paper Code: MITCS102

со	Description: After the completion of the course student will be able
CO1	Ability to analyze algorithms and to determine algorithm correctness and time efficiency class
CO2	Formulate a variety of advanced abstract data type (ADT) and data structures and their implementations.
CO3	Experiment with different algorithm design techniques (brute-force, divide and conquer, greedy, etc
CO4	Ability to apply and implement learned algorithm design techniques and data structures to solve problems
CO5	Examine algorithmic complexity and optimization techniques.
CO6	To perceive the importance of structured data in real world problem solving.

Paper Name: Cryptology Paper Code: MITCS103

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со	Description: After the completion of the course student will be able

CO1	Recall the basic Mathematics on Number theory, probability theory and their application in Security.
CO2	Explain Number theory and basic Mathematics required in Network security and attacks, and importance of public key and symmetric key cryptography.
CO3	Choose the fundamental techniques of some Substitution Techniques, Transposition Techniques and their applications in symmetric key cryptosystems like, DES, IDEA, RC4 and RC5 etc
CO4	Explain Deffie-Helman key exchange protocol with its weakness and other public key cryptographic protocols.
CO5	Develop some security protocols those are applicable in networks

Paper Name: Advanced Web Technology Paper Code: MITCS104

со	Description: After the completion of the course student will be able
CO1	Explain internet development techniques and Protocols leading Web.

CO2	Understand the different approaches in network security models.
CO3	Design different web pages using HTML, XML, CSS, JavaScript, and Java applet
CO4	Create client-server model using socket programming techniques
CO5	Develop interactive internet/web applications based on Servlets and JSP

Paper Name: Research Methodology and IPR Paper Code: MITCS105

со	Description: After the completion of the course student will be able
CO1	Create client-server model using socket programming techniques
CO2	Analyze research related information
CO3	Follow research ethics

CO4	Understand that today's world is controlled by Computer, Information Technology, but tomorrow's world will be ruled by ideas, concepts, and creativity.
CO5	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular
CO6	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits

Paper Name: Advanced Data Structures and Algorithms Paper Code: MITCS192

со	Description: After the completion of the course student will be able
CO1	Implement List ADTs and their operations.
CO2	Develop programs for sorting.
CO3	Develop programs for implementing trees and their traversal operations.
CO4	Implement graph traversal algorithms.

CO5	Apply algorithm design techniques.

Paper Name: Advanced Web Technology Lab Paper Code: MITCS194

со	Description: After the completion of the course student will be able
CO1	Students are able to develop a dynamic webpage by the use of java script and DHTML.
CO2	Students will be able to write a well formed / valid XML document.
CO3	Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on the DBMS table.
CO4	Students will be able to write a server side java application called Servlet to catch form data sent from the client, process it and store it on a database.
CO5	Students will be able to write a server side java application called JSP to catch form data sent from the client and store it on database.

со	Description: After the completion of the course student will be able
CO1	learn Network Footprinting, Collect System Information, Collect Organization's information
CO2	understand Legal aspects of penetration testing
CO3	develop Practical hacking exercise

Paper Name: Network Security Paper Code: MITCS202

СО	Description: After the completion of the course student will be able
CO1	gain knowledge of computer network
CO2	gain knowledge of communication through networks, protocols and algorithms.

CO3	Understand the division of network functionalities into layers.
CO4	familiar with the components required to build different types of networks exposed to the required functionality at each layer
CO5	Learn the flow control and congestion control algorithms

Paper Name: Digital Forensics Paper Code: MITCS203

со	Description: After the completion of the course student will be able
CO1	To provide computer forensics systems
CO2	To provide an understanding Computer forensics fundamentals
CO3	To analyze various computer forensics technologies
CO4	To identify methods for data recovery

CO5 To apply the methods for preservation of digital evidence

Paper Name: Constitution of India Paper Code: MITCS205A

со	Description: After the completion of the course student will be able
CO1	Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective
CO2	To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
CO3	To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Paper Name: Pedagogy Studies Paper Code: MITCS205B

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СО	Description: After the completion of the course student will be able

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CO1	Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
CO2	Identify critical evidence gaps to guide the development.

Paper Name: Stress management by Yoga Paper Code: MITCS205C

со	Description: After the completion of the course student will be able
CO1	To achieve overall health of body and mind
CO2	To overcome stress

Paper Name: Personality development through life enlightenment skills Paper Code: MITCS205D

СО	Description: After the completion of the course student will be able
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CO1	To learn to achieve the highest goal happily
CO2	To become a person with stable mind, pleasing personality and determination
СОЗ	To awaken wisdom in students

Paper Name: Network Security Lab Paper Code: MITCS292

СО	Description: After the completion of the course student will be able
CO1	Develop and implement a java interface for encryption and decryption algorithms i.e., AES, MD5 and RSA algorithms

Paper Name: Digital Forensics Lab Paper Code: MITCS293

со	Description: After the completion of the course student will be able
CO1	Industry best practice when conducting forensic analysis of electronic devices
CO2	End-to-end process and legal requirements for chain of evidence and chain of custody
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CO3	Recognising potential sources of digital evidence
CO4	Requirement for identification of evidence
CO5	Introductory techniques for examining evidence
CO6	How to correctly handle and preserve evidence in a forensically sound manner
CO7	Commonly relied on evidence artifacts
CO8	Gain experience with several tools for forensic analysis
CO9	Report structure and format on the analysis of evidence

Paper Name: Cyber Law and Cyber Crime Investigation Paper Code: MITCS301

со	Description: After the completion of the course student will be able
CO1	provide knowledge related to auditing of computer systems, managing and mitigating risk situations in the organization and techniques for investigating financial frauds
CO2	create awareness on cybercrime & IT law
CO3	Provide the assistance to handle cybercrime
CO4	Learn and assess gender based cybercrime
CO5	identify the emerging Cyber Laws, Cybercrime & Cyber security trends and jurisprudence impacting cyberspace in today's scenario
CO6	enable the participants appreciate, evaluate and interpret the case laws with reference to the IT Act and other Laws associated with the cyberspace

Programme Name: M. Sc in Food Science and Nutrition Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MSCFSN/AllSem21.pdf

Paper Name: Food Microbiology Paper Code: MSUFSN 101

CO	Description: After the completion of the course student will be able
CO1	Recalling microbes and their importance, application in day to day life with special reference to food.
CO2	Illustrate various types of food contamination and spoilage by different microorganisms and their preservation techniques.
CO3	Analyze the physical as well as biochemical changes of spoiled food, food intoxication and food borne pathogens
CO4	Determine the rapid methods in detection of microorganisms along with conventional methodologies.

Paper Name: Nutritional Biochemistry Paper Code: MSUFSN 102

СО	Description: After the completion of the course student will be able
CO1	To build the knowledge of students about biomolecules, their structures, relevant biochemical reactions and nutrition.

CO2	To develop an insight on metabolism of different biomolecules and enzymatic pathways leading to end products.
CO3	To discover the basic concepts of vitamins, hormones and water metabolism.
CO4	To create food products using the basic concepts of nutrition, different nutritional demands and dietary requirements.

Paper Name: Human Physiology Paper Code: MSUFSN 103

со	Description: After the completion of the course student will be able
CO1	Recall the basic knowledge of human anatomy and physiology.
CO2	Outline the different physiological systems of the body and their functions.
CO3	Identify the concept of physiological changes and analyze the importance of hormonal regulation of the body's functions.
CO4	Analyze the concept of digestion and absorption of various nutrients.

Paper Name: Basic Food Science and Preservation Paper Code: MSUFSN 104

со	Description: After the completion of the course student will be able
CO1	Outline the basic concept of structure, classification and nutritional composition of different food commodities.
CO2	Identify the selection, storage and processing technologies.
CO3	Analyze and assess the techniques of food preservation and food standard.

Paper Name: Analytical techniques and Research Methodology Paper Code: MSUFSN 105

со	Description: After the completion of the course student will be able
CO1	Recall previous and basic concepts regarding the working principle of various instruments used in food analysis.
CO2	Illustrate the advantages and reasons for using various instruments in the food sector.

CO3	Identify the various knowledge of instruments to analyze different types of food matrices.
CO4	Analyze the sensitivity and reproducibility of analytical results by the various instruments.
CO5	Design and develop different methods of food analysis using various instruments.

Paper Name: English Communication Skill Paper Code: MSUFSN 106

СО	Description: After the completion of the course student will be able
CO1	Recall the English skills by reading and listening comprehension, writing and speaking.
CO2	Show their vocabulary and use them effectively and appropriately.
CO3	Develop and discover the speaking skills to communicate with each other.

CO4	Assess and improve confidence in the group discussions, seminar
	presentations, viva-voce, job interview etc.

Paper Name: Food Microbiology Lab Paper Code: MSUFSN 191

СО	Description: After the completion of the course student will be able
CO1	Experiment with microbiological instruments used in Food Microbiology laboratory
CO2	Examine methods to isolate of microorganisms from different foods and water sample
CO3	Determine microbiological techniques to standardize quality to solve practical problems
CO4	Design appropriate SOPs for microbiological analysis of food in real-time situation

Paper Name: Biochemistry and Analytical Techniques Lab Paper Code: MSUFSN 192

со	Description: After the completion of the course student will be able
CO1	Build the biochemical composition of food.
CO2	Analyze the different methods of separation and isolation of biochemical components of food.
CO3	Determine effective methodology to identify the common adulterants in food.
CO4	Design appropriate methods for biochemical assays in real situations.

Paper Name: **Basics of Nutrition and Health** Paper Code: **MSUFSN 201**

со	Description: After the completion of the course student will be able
CO1	Recall the basic concept of food, health and malnutrition.
CO2	Outline the basic food groups and daily requirement of nutrients.

CO3	Examine the structure and property of different nutrients.
CO4	Importance of digestion, absorption and function of various nutrients.

Paper Name: Nutritional Program for Public Health Paper Code: MSUFSN 202

СО	Description: After the completion of the course student will be able
CO1	Demonstrate the concept and current concerns of Public Health, Nutrition, and diseases.
CO2	Identify the plan for conducting nutrition education programs in the community.
CO3	Evaluate and develop the idea about nutritional management during disaster.

Paper Name: Nutraceuticals and Functional Foods Paper Code: MSUFSN 203

СО	Description: After the completion of the course student will be able
CO1	Develop comprehensive understanding of different nutraceuticals and functional foods.
CO2	Assume and assess the potential of various functional foods in promoting human health.
CO3	Discuss about the manufacturing processes, regulatory challenges and market trends of nutraceuticals, functional foods and genetically modified foods.

Paper Name: Fermented Foods and its Nutrition Paper Code: MSUFSN 204

со	Description: After the completion of the course student will be able
CO1	Recall the basics on Fermentation and different fermented foods and its nutrition.
CO2	Make use of the knowledge on Food Fermentation and related products.

CO3	Analyze and assess the quality aspects of fermented foods.

Paper Name: Waste Management of Food Industries Paper Code: MSUFSN 205

со	Description: After the completion of the course student will be able
CO1	Interpret the characteristics and classification of wastewater generated from various food industries.
CO2	Identify the various disposal techniques of food industry waste with special attention to their economical aspects.
CO3	Examine the physical, chemical and biological waste treatment and in plant sanitation.
CO4	Choose the treatment methodologies of solid wastes generated from the food industry.
CO5	Discuss the recovery of useful materials from effluents by different methods and environmental legislations to discharge the waste into the environment.

Paper Name: Pickles and Fermented Food Lab Paper Code: MSUFSN 291

со	Description: After the completion of the course student will be able
CO1	Apply and analyze the principles of food fermentation technology
CO2	Determine the quality of fermented foods
CO3	Develop various fermented food

Paper Name: Biometric Assessment of Nutritional Status Paper Code: MSUFSN 292

со	Description: After the completion of the course student will be able
CO1	To recall study on the nutritional status and programme.
CO2	Experiment with the anthropometric/biometric parameters by instrument.
CO3	Make use of anthropometric/biometric and nutritional status operating instruments.

Paper Name: Dietary Management of Diseases Paper Code: MSUFSN 301

СО	Description: After the completion of the course student will be able
CO1	Define various diseases.
CO2	Outline the causes, symptoms, epidemiology and management of various diseases.
CO3	Identify the mechanism of diseases.
CO4	Apply, analyze and assess the dietary modification according to health and nutritional status.

Paper Name: Family Meal Management and Meal Planning Paper Code: MSUFSN 302

со	Description: After the completion of the course student will be able
CO1	Define the principle and need of meal planning.

CO2	Illustrate and identify the physiology and nutritional problems of various phases of life.
CO3	Analyze and assess the role of nutrition.
CO4	Design and develop the meal planning according to individuals needs

Paper Name: Food Processing Paper Code: MSUFSN 303

со	Description: After the completion of the course student will be able
CO1	Relate the basic knowledge of food science to understand the need and importance of food processing.
CO2	Determine the principle, working mechanism, advantages and disadvantages of different methods and techniques of food processing.
CO3	Assess the appropriate application of different types of processes in specific foods ensuring maximum retention of nutritional and organoleptic quality of food products.

Paper Name: **Bioinformatics** Paper Code: **MSUFSN 304**

со	Description: After the completion of the course student will be able
CO1	Explanation of various biological databases of specific interest.
CO2	Identify the whole genome analysis.
CO3	Analyzing and assessing the protein sequencing and their characterization.

Paper Name: Food Processing Lab Paper Code: MSUFSN 393

со	Description: After the completion of the course student will be able
CO1	Construct different methods applied to processing of foods and preservation.
CO2	Construct process flow diagrams and compare various process technologies.
CO3	Analyze the changes of raw food materials during postharvest storage and transformation into food products and classify them.

CO4	Develop innovative methods for process and preservation technologies.
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Paper Name: Bioinformatics Lab Paper Code: MSUFSN 394

СО	Description: After the completion of the course student will be able
CO1	Make use of different software for protein sequencing.
CO2	Discover the Protein sequencing and multiple alignment of protein sequences using sophisticated software.
CO3	Design of protein structure using PDB.

Paper Name: Entrepreneurship and New Venture Planning Management Paper Code: MSUFSN 401

со	Description: After the completion of the course student will be able
CO1	Demonstrate various forms of Entrepreneurship Models.

CO2	Make use of a Business Plan using the tools of Entrepreneurship Management.
CO3	Examine the financial calculations required to validate a Business Plan.
CO4	Importance of Government initiatives and legal processes in Entrepreneurship Management.
CO5	Design the techniques of Business Management for starting an Entrepreneurship Project in the food sector.

Paper Name: Logistics and Supply Chain Management Paper Code: MSUFSN 402

СО	Description: After the completion of the course student will be able
CO1	Relate the importance of Logistics and Supply Chain Management in today's business environment.
CO2	Model the process of smooth flow of goods and services and maximize value generated.
CO3	Examine the various subdivisions such as Warehousing, Inventory and compare the dependency of each such division with each other.

CO4	Estimate Demand forecasting and Material handling.

Programme Name: M. Sc in Food Science and Technology Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MSCFST/AllSem.pdf

Paper Name: Food Microbiology Paper Code: MSUFT 101

со	Description: After the completion of the course student will be able
CO1	Recalling microbes and their importance, application in day to day life with special reference to food.
CO2	Illustrate various types of food contamination and spoilage by different microorganisms and their preservation techniques.
CO3	Analyze the physical as well as biochemical changes of spoiled food, food intoxication and food borne pathogens
CO4	Determine the rapid methods in detection of microorganisms along with conventional methodologies

Paper Name: Nutritional Biochemistry Paper Code: MSUFT 102

со	Description: After the completion of the course student will be able
CO1	To build the knowledge of students about biomolecules, their structures, relevant biochemical reactions and nutrition.
CO2	To develop an insight on metabolism of different biomolecules and enzymatic pathways leading to end products.
CO3	To discover the basic concepts of vitamins, hormones and water metabolism.
CO4	To create food products using the basic concepts of nutrition, different nutritional demands and dietary requirements.

Paper Name: Principles of Food Processing Technology Paper Code: MSUFT103

со	Description: After the completion of the course student will be able
CO1	Relate the basic knowledge of food science to understand the need and importance of food processing.
CO2	Identify the causes of spoilage and how they affect the shelf life of food.

CO3	Determine the principles, working mechanism, advantages and disadvantages of different methods and techniques of food processing.
CO4	Evaluate preservation principles in product design and value addition of food products.
CO5	Formulate the appropriate application of different types of processes in specific foods ensuring maximum retention of nutritional and organoleptic quality of food products.

Paper Name: Fermentation Technology Paper Code: MSUFT 104

со	Description: After the completion of the course student will be able
CO1	To define biological and biochemical technology, with a focus on biological products by fermentation.
CO2	Summarize the knowledge of the fermentative processes used in the industrial production of primary and secondary metabolites, biomasses and recombinant proteins.
CO3	Identify the types of fermentation and the design and construction of fermenter and parameters to be monitored and controlled in the fermentation process in laboratory scale and industrial processes.

CO4	Compile the production of various fermented foods.

Paper Name: Mathematical Techniques for Food Science Paper Code: MSUFT 105

со	Description: After the completion of the course student will be able
CO1	Recall different types of matrices, their eigen values, eigen vectors, rank and also their orthogonal transformations essential for physical and engineering problems.
CO2	Outline the domain of applications of mean value theorems to engineering problems.
CO3	Experiment with the tools of power series and Fourier series, infinite series for solving engineering problems related to the food industry.
CO4	Analyze the concept and techniques of differential and integral calculus to determine curvature and evaluation of different types of improper integrals.
CO5	Design real life problems which comprise several variables or attributes and identify extreme points of different surfaces of higher dimensions.

Paper Name: Analytical techniques and Research Methodology

Paper Code: MSUFT 106

со	Description: After the completion of the course student will be able
CO1	Recall previous and basic concepts regarding the working principle of various instruments used in food analysis.
CO2	Illustrate the advantages and reasons for using various instruments in the food sector.
CO3	Identify the various knowledge of instruments to analyze different types of food matrices.
CO4	Analyze the sensitivity and reproducibility of analytical results by the various instruments.
CO5	Design and develop different methods of food analysis using various instruments.

Paper Name: English Communication Skill Paper Code: MSUFT 107

CO	Description: After the completion of the course student will be able
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CO1	Recall the English skills by reading and listening comprehension, writing and speaking.
CO2	Show their vocabulary and use them effectively and appropriately.
CO3	Develop and discover the speaking skills to communicate with each other.
CO4	Assess and improve confidence in the group discussions, seminar presentations, viva-voce, job interview etc.

Paper Name: Food Microbiology Lab Paper Code: MSUFT 191

со	Description: After the completion of the course student will be able
CO1	Experiment with microbiological instruments used in Food Microbiology laboratory
CO2	Examine methods to isolate of microorganisms from different foods and water sample
CO3	Determine microbiological techniques to standardize quality to solve practical problems

CO4	Design appropriate SOPs for microbiological analysis of food in real-time
	situation

Paper Name: Biochemistry and Analytical Techniques Lab Paper Code: MSUFT 192

со	Description: After the completion of the course student will be able
CO1	Build the biochemical composition of food.
CO2	Analyze the different methods of separation and isolation of biochemical components of food.
CO3	Determine effective methodology to identify the common adulterants in food.
CO4	Design appropriate methods for biochemical assays in real situations.

Paper Name: Food Chemistry Paper Code: MSUFT 201

со	Description: After the completion of the course student will be able
CO1	Outline and identify the various food groups, the nutrient components (macro and micro), and proximate composition of food components.
CO2	List the chemistry underlying the properties and reactions of various food components.
CO3	Decide the functional role of food components and their interaction in food products in terms of color, flavor, texture and nutrient composition.
CO4	Formulate diet charts from the knowledge of different nutrients, calorific value and other health benefits.

Paper Name: Technology of Fruit and Vegetables Paper Code: MSUFT 202

со	Description: After the completion of the course student will be able
CO1	Recall and outline the concept of processing and products manufactured from various fruits and vegetables.
CO2	Build the technology of physiological and physicochemical characteristics of fruits and vegetables.

CO3	Examine the methods to prevent the fruit and vegetable loss after production or during storage.
CO4	Evaluate scientific principles and technologies for product development out of fruits and vegetables
CO5	Develop various new processing technologies for preservation of fruit and vegetables.

Paper Name: Technology of Cereals, Pulses and Oilseeds Paper Code: MSUFT 203

СО	Description: After the completion of the course student will be able
CO1	Recall and outline the concept of processing and products manufactured from cereals, pulses and oilseeds.
CO2	Build the technology of physiological and physicochemical characteristics of cereals, pulses and oilseeds.
CO3	Examine the methods to prevent the loss of cereals, pulses and oilseeds after production or during storage.
CO4	Evaluate scientific principles and technologies for product development out of cereals, pulses and oilseeds.

CO5	Develop various new processing technologies for preservation of cereals, pulses and oilseeds.

Paper Name: Technology of Milk and Milk Products Paper Code: MSUFT 204

со	Description: After the completion of the course student will be able
CO1	Recall and outline the various properties and composition of milk.
CO2	Build the technology of manufacturing various milk products.
CO3	Analyze and assess the safety and quality methods to determine the acceptability of the dairy products by consumers including cleaning and sanitation in the dairy industry.
CO4	Design various techniques to address practical problems of milk processing and preservation in the industry.
CO5	Develop methods to utilize various by-products of the dairy industry.

Paper Name: Waste Management of Food Industries Paper Code: MSUFT 205

со	Description: After the completion of the course student will be able
CO1	Interpret the characteristics and classification of wastewater generated from various food industries.
CO2	Identify the various disposal techniques of food industry waste with special attention to their economical aspects.
CO3	Examine the physical, chemical and biological waste treatment and in plant sanitation.
CO4	Choose the treatment methodologies of solid wastes generated from the food industry.
CO5	Discuss the recovery of useful materials from effluents by different methods and environmental legislations to discharge the waste into the environment.

Paper Name: Statistical Techniques for Food Science Paper Code: MSUFT 206

со	Description: After the completion of the course student will
	be able

CO1	Construct the interpolating polynomial for both equispaced and un- equispaced arguments.
CO2	Discover graphical displays of science/engineering data and interpret the role of such displays in data analysis.
CO3	Choose basic statistical inference techniques, including confidence intervals, hypothesis testing and analysis of variance, to science/engineering problems.
CO4	Choose appropriate regression models to determine statistical relationships.
CO5	Design numerical techniques to solve food engineering problems.

Paper Name: Pickles and Fermented Food Lab Paper Code: MSUFT 291

СО	Description: After the completion of the course student will be able
CO1	Apply and analyze the principles of food fermentation technology

CO2	Determine the quality of fermented foods
CO3	Develop various fermented food

Paper Name: Food Process Technology Lab Paper Code: MSUFT 292

со	Description: After the completion of the course student will be able
CO1	Construct different methods applied to processing of foods and preservation.
CO2	Construct process flow diagrams and compare various process technologies.
CO3	Analyze the changes of raw food materials during postharvest storage and transformation into food products and classify them
CO4	Develop innovative methods for process and preservation technologies.

Paper Name: Technology of Meat, Fish and Poultry

Paper Code: MSUFT 301

со	Description: After the completion of the course student will be able
CO1	Recalling the basic concepts of biology, define the basic structure and biochemical composition of muscle foods and eggs and how these may undergo changes during ante & post mortem handling, processing and storage.
CO2	Explain the spoilage mechanisms in freshly harvested fish, meat and egg and estimate their quality using opposite qualitative and quantitative biochemical, physical or organoleptic parameters.
CO3	Explain the principle and applicability of different preservation technologies and apply this knowledge to prescribe suitable preservation methods for freshly harvested fish, animals and eggs.
CO4	Analyze ante mortem handling techniques and stunning methods to minimize pain and struggle of animals and frame a hygienic slaughtering process to yield high quality muscle food.
CO5	Evaluate the possibilities of value addition of fish; meat, poultry to design processing and manufacture of value added products and specialty foods
CO6	Identify potential in the by-products originating from fish, meat and poultry industries and propose the manufacture of various food, feed and non-food products.

Paper Name: Food Packaging Technology Paper Code: MSUFT 302

со	Description: After the completion of the course student will be able
CO1	Define, recall, and relate basic packaging technologies with respect to manufacturing methodologies, potential material development to address substantiated solutions to practical food preservation and transportation problems.
CO2	Interpret the need, and to have the preparation for independent, life- long learning in the emerging areas of packaging technology in synergy with other technological applications.
CO3	Interpret and demonstrate as a professional, who has comprehensive knowledge on regulatory requirements for food packaging and allied areas to meet societal needs within realistic constraints such as economic, environmental, ethical, legal, cultural, health and safety, feasibility, and sustainability.
CO4	Examine and analyze problems associated with difficulties related to packaging material, methodologies and food components to be packaged.
CO5	Create, develop and formulate appropriate packaging technologies with the aid of various tools with a view to work in real life situations and as independent entrepreneurs.

Paper Name: Food Safety and Quality Control

Paper Code: MSUFT 303

со	Description: After the completion of the course student will be able
CO1	Recall principles and basics of biological, chemical and physical hazards in food industry
CO2	Compare the problems arising in quality control and quality assurance policies and regulations in the food processing industry.
CO3	Choose and analyze existing food laws and quality management techniques in relation to follow legal limits and supply safe food to consumers.
CO4	Examine or interpret data and apply various tools to reach a sustainable solution in food safety and quality management systems in industries.
CO5	Decide and apply methods to meet specific needs of food safety and maintain the quality of food during processing, storage, distribution taking public health and safety, cultural, societal and environmental issues into consideration following the standard regulations.

Paper Name: Process Control and Instrumentation Paper Code: MSUFT 304

со	Description: After the completion of the course student will be able
CO1	Explain the basic concepts of process control and its application in food technology.
CO2	Make use of the sensors and transducers for food processing.
CO3	Analyze the stability of a food processing system.
CO4	Make use of the controller and actuators.
CO5	Elaborate Computerized control, Intelligent control, ANN, Fuzzy logic, Genetic Algorithm, PLC and SCADA for food processing systems

Paper Name: Milk and Milk Product Processing Lab Paper Code: MSUFT 391

со	Description: After the completion of the course student will be able
CO1	Construct methods to handle milk safely in industry keeping quality factors in mind.

CO2	Experiment with different methods of analysis of milk required to perform in industrial laboratories.
CO3	Analyze and assess the milk quality and apply various methods for various methods for safe handling, cleaning, sanitation and CIP in dairy industry
CO4	Develop and formulate methods for analysis of new dairy products and also by-product utilization in the dairy industry.

Paper Name: Meat and Fish Processing Lab Paper Code: MSUFT 392

со	Description: After the completion of the course student will be able
CO1	Construct methods to handle meat and fish safely in industry keeping quality factors in mind.
CO2	Experiment with different methods of analysis of meat and fish required to perform in an industrial laboratory.
CO3	Analyze and assess the meat and fish quality
CO4	Develop and formulate methods for analysis of new meat and fish products.
Programme Name: MASTER OF SCIENCE IN APPLIED PSYCHOLOGY Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MSCAP/AIISem21.pdf

Paper Name: APPLIED COGNITIVE PSYCHOLOGY Paper Code: MSCAPY 101

со	Description: After the completion of the course student will be able
CO1	Define the basic principles of cognitive psychology and neuroscience
CO2	Explain the working principle of the various domains of cognitive psychology
CO3	Use the principles to explain human cognitive functioning and challenges
CO4	Compare and Contrast the different perspectives to make a coherent sense of behavior

Paper Name: **PERSONALITY THEORIES AND APPLICATIONS** Paper Code: MSCAPY 102

со	Description: After the completion of the course student will be able

CO1	Define Personality and its different facets
CO2	Explain the various perspectives of Personality in details
CO3	Use the principles to assess human behavior
CO4	Compare and Contrast the different perspectives to make a coherent sense of behavior

Paper Name: STATISTICAL METHODS FOR APPLIED PSYCHOLOGY Paper Code: MSCAPY 103

со	Description: After the completion of the course student will be able
CO1	Define Statistics and its different types
CO2	Explain the methods of generating and testing hypotheses
CO3	Use the statistics to confirm or disprove hypotheses

CO4	Compare and Contrast the different statistical approaches to choose the best approach in any situation

Paper Name: **RESEARCH METHODS IN APPLIED PSYCHOLOGY** Paper Code: MSCAPY 104

со	Description: After the completion of the course student will be able
CO1	Define the different approaches to research
CO2	Explain the methods of conducting research
CO3	Use appropriate research methods to undertake assignments and projects
CO4	Compare and Contrast the different research methods to choose the best approach according to the research problem

Paper Name: Practical on Personality Paper Code: MSCAPY-191A

со	Description: After the completion of the course student will be able
CO1	Illustrate various theories of personality.
CO2	Develop capability to apply knowledge of personality practical approach for self and societal growth
CO3	It enables students to become familiar with the major practical and traditions related to the study of personality and personal growth.
CO4	It further enables the student to articulate the underlined themes, methodology and assumption of each theory to enhance understanding of personality and behavior.

Paper Name: Practical on Statistical Packages (SPSS) Paper Code: MSCAPY-191B

со	Description: After the completion of the course student will be able
CO1	Students will review several statistical techniques and discuss situations in which they would use each technique.
CO2	How to set up the analysis, as well as how to interpret the results.

CO3	This includes a broad range of techniques for exploring and summarizing data, as well as investigating and testing relationships.
CO4	Students will gain an understanding of when and why to use these various techniques as well as how to apply them with confidence, interpret their output, and graphically display the results.

Paper Name: APPLYING PSYCHOLOGY IN THE SOCIETY Paper Code: MSCAPY 201

со	Description: After the completion of the course student will be able
CO1	Define the different social concepts
CO2	Explain the evolving nature of social relationships
CO3	Use appropriate social methods to undertake assignments and projects
CO4	Compare and Contrast the different social concepts to make a coherent sense of the changing times

Paper Name: DEVELOPMENT ACROSS THE LIFESPAN Paper Code: MSCAPY 202

со	Description: After the completion of the course student will be able
CO1	Define the different levels and stages of prenatal and postnatal human development
CO2	Explain the different principles surrounding the domains of development
CO3	Use appropriate models to understand the developmental context of real-life examples
CO4	Compare and Contrast the different developmental models to make a coherent sense of the different stages of life of individuals

Paper Name: BIOLOGICAL FOUNDATIONS OF BEHAVIOUR Paper Code: MSCAPY 203

со	Description: After the completion of the course student will be able
CO1	Define the structure and functions of the nervous system

CO2	Explain the the process of neural development and the role of plasticity in development and recovery of function
CO3	Use the understanding of nervous system to recognize brain systems mediating sexual and reproductive behavior, emotions, learning, memory, and consciousness
CO4	Compare and Contrast the different biological models and methods to make sense of different human conditions

Paper Name: **PSYCHOLOGY FOR HAPPINESS AND POSITIVITY** Paper Code: MSCAPY 204

со	Description: After the completion of the course student will be able
CO1	Define what positive psychology is about
CO2	Explain the the process of flow and other positive experiences
CO3	Use the understanding of positive psychology across major domains of life

CO4	Compare and Contrast the different approaches to make sense of recent global changes

Paper Name: Practical on social psychology Paper Code: MSCAPY-291

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со	Description: After the completion of the course student will be able
CO1	In this core course students develop an understanding of the individual in relation to the Social world
CO2	the core course also introduces students to the realm of social influence as to how individuals think feel and behave in social situations

Paper Name: Practical on Relaxation procedures Paper Code: MSCAPY-292

со	Description: After the completion of the course student will be able
CO1	Managing stress: Methods - yoga, meditation, relaxation techniques, Problem focused and emotion focused approaches.
CO2	Stress and health: effects of stress on health, eustress

CO3	Various sources of stress: environmental, social, physiological and psychological
CO4	Stress: Introduction, Nature of stress, symptoms of stress

Paper Name: ADULT PSYCHOPATHOLOGY Paper Code: MSCAPY 301

со	Description: After the completion of the course student will be able
CO1	Define the different aspects of psychopathology
CO2	Explain the the process of development of psychopathology
CO3	Use the understanding of psychopathology to understand major disorders
CO4	Compare and Contrast the different psychopathological approaches to understand the causes behind disorders

Paper Name: **CHILD PSYCHOPATHOLOGY** Paper Code: MSCAPY 302

со	Description: After the completion of the course student will be able
CO1	Define the different aspects of psychopathology
CO2	Explain the the process of development of psychopathology
CO3	Use the understanding of psychopathology to understand major disorders
CO4	Compare and Contrast the different psychopathological approaches to understand the causes behind disorders

Paper Name: **STRESS MANAGEMENT** Paper Code: MSCAPY 303

со	Description: After the completion of the course student will be able
CO1	Define the different aspects of stress

CO2	Explain the the process of development of stress
CO3	Use the understanding of models to explain stress related disorders
CO4	Compare and Contrast the different management approaches to deal with stress

Paper Name: PSYCHOLOGY OF TECHNOLOGY: BEING HUMAN IN THE AGE OF ARTIFICIAL INTELLIGENCE Paper Code: MSCAPY 304

со	Description: After the completion of the course student will be able
CO1	Define the different aspects of intelligence
CO2	Explain perspectives of intelligence
CO3	Explain the concept of AI & AGI

CO4	Analyze the concept of networking in aspects of psychology

Paper Name: COUNSELING AND PSYCHOTHERAPY Paper Code: MSCAPY 401

со	Description: After the completion of the course student will be able
CO1	Define what is counseling and psychotherapy
CO2	Explain the process of counseling and psychotherapy
CO3	Use the understanding of models to interpret counseling sessions
CO4	Compare and Contrast the different techniques of counseling and psychotherapy to choose appropriate one as per context

Paper Name: **APPLIED HEALTH PSYCHOLOGY** Paper Code: MSCAPY 402

со	Description: After the completion of the course student will be able
CO1	Define what is health psychology
CO2	Explain the psychological repercussions of physical diseases
CO3	Use the principles of health psychology in general medical setting
CO4	Compare and Contrast the different techniques of intervention across general healthcare settings

Paper Name: **COMMUNITY PSYCHOLOGY** Paper Code: MSCAPY 403

со	Description: After the completion of the course student will be able
CO1	Define the nature and context of community psychology
CO2	Explain the role of a community psychologist

CO3	Use the principles of community psychology to help find solutions to social problems
CO4	Compare and Contrast the different techniques of community based interventions for solving real-life issues

Programme Name: M.Tech in Biotechnology

Syllabus link: http://makautexam.net/aicte_details/Syllabusl/MTECHBT/AllSem21.pdf

Paper Name: **Biochemistry** Paper Code: **MUBT-101**

со	Description: After the completion of the course student will be able
CO1	Illustrate various biomolecular components
CO2	Relate metabolic pathways, enzyme catalysis, disease pathogenesis
CO3	Analyze proteins, lipids, nucleic acid, saccharides structures and functional organizations,
CO4	Explain various biomolecular hierarchy, biochemical regulations and energetics

CO5	Determine structural formations and self-assembly systems for
	various pathological conditions from the perspective of biochemical
	reactions

Paper Name: Cell and Molecular Biology Paper Code: MUBT-102

со	Description: After the completion of the course student will be able
CO1	Explain the structure and function of different intracellular organelles.
CO2	Build concept about Chromatin structure, DNA replication, transcription and protein synthesis
CO3	Formulate the mechanisms of protein trafficking at different cellular compartments.
CO4	Assess the regulatory mechanisms that control cellular reproduction and cell death.
CO5	Analyze the structure of the isolated cells and further manipulation on cells

CO6	Demonstrate the genome instability as well as cellular transformation
C07	Explain the basics of Mendelian Genetics and Inheritance pattern based of extension to the Mendelian genetics

Paper Name: Introduction to Engineering Principles Paper Code: MUBT-103

со	Description: After the completion of the course student will be able
CO1	Students can explain the fundamental concepts of bioprocess technology and its related applications
CO2	Apply the principles of chemical engineering to bioprocesses.
CO3	Examine the material balance of reactive and non-reactive systems
CO4	Apply the single and multi-components of bioprocess systems.
CO5	Apply transport phenomena in bioprocess systems.

Paper Name: Microbiology Paper Code: MUBT-104

со	Description: After the completion of the course student will be able
CO1	Explain the microbial morphology, growth, culture method and genetics of bacteria, antimicrobial resistance and different methods of gene transfer.
CO2	Apply the knowledge of microbial classification and metagenomics for identification of unculturable microbes
CO3	Explain the importance of sterilization, disinfection and the antimicrobial agents.
CO4	Explain classification, structures, properties, cultivation methods of virus and other allied infectious agents.
CO5	Explain host-pathogen interaction, ecological impacts of microbes, microbial communication system and microbial fuel cells.

Paper Name: Plant and Animal Cell Culture Technology Paper Code: MUBT-105

со	Description: After the completion of the course student will be able
CO1	Explain the fundamental concepts of animal cell culture system
CO2	Apply the knowledge to meet challenges of new and emerging areas of plant/ animal biotechnology research in academia and industry.
CO3	Build the concept about plant tissue and organ culture, Plant growth regulators as well as different types of genetic manipulation of plant tissue.
CO4	Develop an idea on the principles, design, operation of bioreactors and downstream processing for mammalian and plant systems and strategies for fermentation with recombinant organisms.

Paper Name: Basics of Mathematics and Statistics Paper Code: MUBT-106

со	Description: After the completion of the course student will be able
CO1	Explain of algebraic structure and real analysis followed by different real-life applications

CO2	Relate the idea of differentiation and integration with applications
CO3	Develop mathematical models for biological systems and analyse the using mathematical tool
CO4	Apply the statistical theory in biotechnology domain

Paper Name: Basics of Chemistry and Physics Paper Code: MUBT-107

со	Description: After the completion of the course student will be able
CO1	Illustrate different Physical quantities and their dynamics important for biology
CO2	Extend thermodynamic principles in biological applications
CO3	Summarize the basic constituents of matter
CO4	Infer chemical thermodynamics principles and their importance in biological system

Paper Name: Laboratory I: Biochemistry & Analytical Techniques Paper Code: MUBT-191

со	Description: After the completion of the course student will be able
CO1	Demonstrate Spectroscopy
CO2	Apply buffer system
CO3	Analyze protein with gel electrophoresis
CO4	Estimate unknown concentration of protein
CO5	Estimate unknown DNA concentration

Paper Name: Laboratory II: Microbiology Lab Paper Code: MUBT-192

со	Description: After the completion of the course student will be able
CO1	Demonstrate preparation of medium for bacterial culture
CO2	Demonstrate the maintenance of microbial culture
CO3	demonstrate staining of bacterial cell
CO4	compare the results of using various types of microscopic techniques
CO5	compare various biochemical tests for microbial identification.
CO6	determine minimum inhibitory concentration (MIC) and experimental procedure to isolate bacteria from environment

Paper Name: Genetic Engineering Paper Code: MUBT-201

со	Description: After the completion of the course student will be able
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CO1	Explain the applications of different tools for genetic engineering
CO2	Build concept about different types of vectors for gene cloning and expression
CO3	Apply d ifferent types of PCR techniques according to their application
CO4	Compare between different methods of cDNA analysis
CO5	Categorize gene silencing and genome editing technologies for the creation of transgenic plant and animal

Paper Name: Immunology Paper Code: MUBT-202

со	Description: After the completion of the course student will be able
CO1	Infer the fundamental concepts of Immunology

CO2	Identify the cellular and molecular basis of immune responsiveness.
CO3	Explain the immune system in cancer, tumor immunology, vaccination and immunotherapy
CO4	Develop immunological experiments to predict the nature of immune response against bacterial, viral infection and allergic reaction.
CO5	Analyze genetic links of diseases and therapeutic interventions used against immunological disorders and infections.

Paper Name: **Bioprocess Engineering & Technology** Paper Code: **MUBT-203**

СО	Description: After the completion of the course student will be able
CO1	Apply the fundamental concepts of bioprocess technology in production of bioproducts.
CO2	Discuss the challenges of the new and emerging areas of the biotechnology industry.
CO3	Examine the stoichiometric balance equation of any bioprocess system.

CO4	Utilize the established microbial and enzyme technology processes for production of biochemicals and bioproducts.
CO5	Model a simple bioreactor for application to various processes.

Paper Name: Downstream Processing in Biotechnology Paper Code: MUBT-204

со	Description: After the completion of the course student will be able
CO1	Classify different unit operations applied for biological products purification
CO2	Categorize various quality characterization and monitoring tools for bio- products
CO3	Identify process steps for recovery of bio-therapeutics and metabolites
CO4	Interpret diverse operations for bio-products recovery
CO5	Design unit operations for product recovery and product polishing

Paper Name: **Bioreactor Operations** Paper Code: **MUBT-205**

со	Description: After the completion of the course student will be able
CO1	Classify bioprocess equipment used in upstream and downstreaming.
CO2	Make use of Process flow diagram and general bioreactor design information.
CO3	Compare concepts of cGMP, validation, equipment cleaning regarding the equipment for production of bio therapeutics.
CO4	Explain the basic bioreactor operations using immobilized cells and enzymes.
CO5	utilize knowledge for bioreactor scale up and scale down aspects.

Paper Name: Computational Biology Paper Code: MUBT-206

со	Description: After the completion of the course student will be able
CO1	Choose various computational tools and databases and demonstrate their applications.
CO2	Interpret meaningful information from different databases, integrate and code for computational tools and methods necessary for omics data analysis
CO3	Examine accurate and comprehensive information about the structures and energies of biomolecules at an atomic level
CO4	Apply the computational tools to study the dynamics of biomolecules by computer simulation
CO5	Develop knowledge of functional and structural bioinformatics and apply in different fields including drug design
CO6	Create hypothesis for investigating specific contemporary biological questions, provide help to experiment design or develop appropriate tools

Paper Name: Laboratory III: Molecular Biology and Genetic Engineering Lab Paper Code: MUBT-291

СО	Description: After the completion of the course student will be able
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CO1	Build concept about lac operon
CO2	Examine UV mutagenesis to isolate amino acid auxotroph.
CO3	Demonstrate Plasmid DNA isolation, DNA quantitation, gene transfer techniques and restriction enzyme digestion of plasmid DNA
CO4	Analyze polymerase chain reaction products using agarose gel electrophoresis
CO5	Explain competent cell preparation and transformation of <i>E.coli</i> with standard plasmids
CO6	Determine transformation efficiency, recombinant protein expression and inclusion body formation in <i>E.coli</i>
CO7	Estimate the purification of His-tagged protein using Ni-NTA columns

Paper Name: Laboratory IV: Immunology Paper Code: MUBT-292

CO1	Experiment with immunological techniques with the laboratory animals and human blood samples
CO2	Experiment with immunological techniques such as immunoblotting, ELISA, immunodiffusion.
CO3	Experiment with mammalian cell culture system
CO4	Experiment with preparation of antigens, immunization and methods of blood collection.

Paper Name: Bioprocess Equipment Design and Economics Paper Code: MUBT-301

со	Description: After the completion of the course student will be able
CO1	Interpret the cost involved in a basic Bioprocess Plant
CO2	Design basic Heat transfer equipment for a bioprocess plant

CO3	Design basic Mass transfer equipment for a bioprocess plant
CO4	Design basic Reaction equipment for a bioprocess plant
CO5	Build a proto-type of a Bioprocess Plant

Paper Name: **Bioentrepreneurship** Paper Code: **MUBT-302**

со	Description: After the completion of the course student will be able
CO1	Classify different facets of bio-business bio-market and technology management
CO2	Categorize various quality characterization and monitoring tools for bio- products
CO3	Identify management techniques & principles in bio-businesses
CO4	Interpret concepts of entrepreneurship

CO5	Identify various knowledge centers and promotional schemes for bio-entrepreneurship

Paper Name: Instrumentation and Control Paper Code: MUBT-303

со	Description: After the completion of the course student will be able
CO1	Relate modeling considerations in various dynamic processes.
CO2	Model non-linear systems, transfer functions in bioprocesses .
CO3	Identify devices for measurement of temperature, fluid flow, pH, in bioreactions.
CO4	Solve various aspects of dynamic processes and feed back controls.

Paper Name: Intellectual Property Rights, Biosafety and Bioethics Paper Code: MUBT-304

со	Description: After the completion of the course student will be able
CO1	Students will be able to demonstrate awareness about Intellectual Property Rights (IPRs) to take measures to protect their ideas.
CO2	Students will able to apply the knowledge to make business strategies by taking account of IPR to protect the of products derived from biotechnology research and issues related to application and obtaining patents
CO3	Students will be able to illustrate the knowledge on biosafety and risk assessment of products derived from recombinant DNA research and environmental release of genetically modified organisms, national and international regulations
CO4	Students will be able to explain the regulatory affairs of Biotechnology research.
CO5	Students will be able to infer ethical aspects related to biological, biomedical, health care and biotechnology research

Paper Name: Research Methodology and Scientific Communication Skills Paper Code: MUBT-305

со	Description: After the completion of the course student will be able
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CO1	Illustrate the principles of research methodology along with scientific writings and presentations
CO2	Organize research questions and laboratory practices
CO3	Relate history of scientific reasoning and scientific methodologies
CO4	Analyze scientific publications through case studies
CO5	Appraise the ethics of scientific communications and research proposal

Paper Name: Laboratory V: Downstream Processing in Biotechnology Paper Code: MUBT-391

CO	Description: After the completion of the course student will be able
CO1	Able to apply the filtration methods
CO2	Able to utilize centrifugation methods for separation of insoluble solutes.

CO3	Able to apply the chromatography methods for separation of soluble bioproducts
CO4	Able to use methods of membrane- based filtration for applications in bioproduct purifications
CO5	Can measure the suitable downstream method required for separation of bioproducts.

Programme Name: BACHELOR OF SCIENCE IN PSYCHOLOGY Syllabus link: http://makautexam.net/aicte_details/SyllabusI/BSCP/AllSem21.pdf

Paper Name: INTRODUCTION TO PSYCHOLOGY Paper Code: BSCPY101

СО	Description: After the completion of the course student will be able
CO1	Define Psychology and basic concepts of Emotion, Motivation, and Intelligence
CO2	Explain the nature of Psychology and its basic Principles
CO3	Use the principles to explain human behavior
CO4	Compare and Contrast the different perspectives to make a coherent sense of behavior

Paper Name: **BIOLOGICAL PSYCHOLOGY** Paper Code: **BSCPY102**

со	Description: After the completion of the course student will
	be able

CO1	Explain the basic structures and functions of the Nervous system
CO2	Interpret the brain functions in light of different human abilities
CO3	Identify which area of the nervous system is responsible of major human functions

Paper Name: PRACTICAL 1: PRACTICAL ON REACTION TIME, AROUSAL, AND IDENTIFICATION OF CHANGES IN FACIAL EXPRESSIONS OF EMOTION Paper Code: BSCPY 191

со	Description: After the completion of the course student will be able
CO1	Use the concept of emotion in various real life situations
CO2	Apply the concept of subjective response on several cognitive tasks

Paper Name: PRACTICAL 2 – PROJECT BASED PRACTICAL ON MEMORY FUNCTIONING INCLUDING BEDSIDE TESTS Paper Code: BSCPY 192

СО	Description: After the completion of the course student will be able
CO1	Apply the memorization skill on various types of functioning
CO2	Develop practical skills on memory functioning

Paper Name: COMMUNICATIVE ENGLISH Paper Code: BSCPY 104

со	Description: After the completion of the course student will be able
CO1	Demonstrate the basic concepts of the usage of English grammar & vocabulary in communication.
CO2	List facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating the main ideas given in written texts
CO3	Apply acquired linguistic knowledge in producing various types of written texts
CO4	Develop and demonstrate the speaking skills for group discussions
Paper Name: INTRODUCTION TO STATISTICAL METHODS FOR PSYCHOLOGICAL RESEARCH Paper Code: BSCPY201

со	Description: After the completion of the course student will be able
CO1	Define and Describe the basic concepts of different types of statistical measures
CO2	Implement appropriate statistical measures to assess centrality of variables
CO3	Compare and Contrast the effectiveness of parametric and non-parametric statistics
CO4	Report data in a graphical format

Paper Name: **PSYCHOLOGY OF INDIVIDUAL DIFFERENCES** Paper Code: **BSCPY202**

СО	Description: After the completion of the course student will
	be able

CO1	Define and Explain Personality and its multifaceted nature
CO2	Interpret human behavior to understand the self in light of eastern and western principles
CO3	Use the principles to explain human behaviors in corporate, clinical, or school sector
CO4	Compare and Contrast the different perspectives to make a coherent sense of behavior

Paper Name: PRACTICAL 3 – PRACTICAL ON STATISTICAL METHODS INCLUDING USAGE OF EXCEL Paper Code: BSCPY 291

со	Description: After the completion of the course student will be able
CO1	Use the statistical methods and excel
CO2	Apply the statistical knowledge on research

Paper Name: PRACTICAL 4: PRACTICAL ON ASSESSING INTELLIGENCE AND PERSONALITY Paper Code: BSCPY 292

со	Description: After the completion of the course student will be able
CO1	Use the intelligence and personality in clinical and non-clinical setting
CO2	Develop the ability of psychological testing

Paper Name: Ecology: Ecosystem Dynamics and Conservation Paper Code: BSCPY-204

со	Description: After the completion of the course student will be able
CO1	Understand and evaluate the global scale of environmental problems.
CO2	Inspect critically on their roles, responsibilities, and identities as citizens, consumers and environmental actors in a complex, interconnected world
CO3	Apply critical thinking, problem-solving, and the methodological approaches of the social sciences, natural sciences, and humanities in environmental problem solving.

Paper Name: Basic Computer Programming and Introduction to Python Paper Code: BSCPY-206

со	Description: After the completion of the course student will be able
CO1	Understand the principles of Python and acquire skills in programming in python.
CO2	Interpret the fundamental Python syntax and semantics and be fluent in the use of control flow statements.
CO3	Implement Python programs with conditionals and loops.
CO4	Represent compound data using Python lists, tuples, dictionaries, Files and modules.

Paper Name: SCHOOLS OF THOUGHT IN PSYCHOLOGY: HISTORY AND EVOLUTION Paper Code: BSCPY 301

СО	Description: After the completion of the course student will be able
CO1	Define and Explain different schools of thought in psychology

CO2	Define and Explain the different perspectives in psychological thought Interpret human behavior to understand the self in light of eastern and western principles
CO3	Use contemporary perspectives to examine the behaviors of major contemporary personalities
CO4	Argue and defend a major psychological orientation to thought to indicate development of a personal philosophy

Paper Name: **RESEARCH METHODS IN PSYCHOLOGY** Paper Code: **BSCPY 302**

со	Description: After the completion of the course student will be able
CO1	Define and Explain the basic orientations to research like qualitative and quantitative
CO2	Use the knowledge to execute a tool development
CO3	Use knowledge to interpret research designs of studies

CO4	Compare and Contrast the different types of research to find out the
	most appropriate methodology in different situations

Paper Name: SOCIAL PSYCHOLOGY Paper Code: BSCPY303

со	Description: After the completion of the course student will be able
CO1	Define and Explain how human behavior is viewed from the social perspective
CO2	Interpret human attitude to examine their mental states
CO3	Compare the different processes of self and how they are organized into a whole
CO4	Recognize different instances of stereotype and prejudice in the society

Paper Name: Gender as well as Diversity and Inclusion Paper Code: BSCPY391

со	Description: After the completion of the course student will be able
CO1	Use the concept of gender related issue in determining various social concepts
CO2	Develop the concept of social issues

Paper Name: UNDERSTANDING PSYCHOLOGICAL DISORDERS Paper Code: BSCPY 401

со	Description: After the completion of the course student will be able
CO1	Define and Explain normality and abnormality
CO2	Classify anxiety and mood disorders
CO3	Sketch the clinical picture of anxiety and mood disorders

CO4	Compare and Contrast the different perspectives of anxiety and mood disorders to arrive at a coherent etiology

Paper Name: STATISTICAL METHODS FOR PSYCHOLOGICAL RESEARCH II Paper Code: BSCPY 402

со	Description: After the completion of the course student will be able
CO1	Define and Explain descriptive, inferential, and predictive statistics
CO2	Interpret data using descriptive, inferential, and predictive statistics
CO3	Report results based out of descriptive, inferential, or predictive statistics
CO4	Compare and Contrast the effectiveness of different statistical measures to explain psychological data

Paper Name: APPLIED SOCIAL PSYCHOLOGY Paper Code: BSCPY 403

со	Description: After the completion of the course student will be able
CO1	Define and classify the different types of social groups
CO2	Examine prosocial and aggressive behaviors in the social contexts
CO3	Use knowledge of group influence to describe social behavior
CO4	Compare and Contrast the different ways to form an impression on others to improve interpersonal relations

Paper Name: PRACTICAL ON ASSESSING PSYCHOLOGICAL SYMPTOMS OF ANXIETY AND DEPRESSION Paper Code: BSCPY 491

СО	Description: After the completion of the course student will be able
CO1	Use tests in clinical settings

CO2	Develop testing knowledge in clinical setting
CO3	Apply the tests in non-clinical groups

Paper Name: PRACTICAL ON T TEST AND CHI SQUARE TEST Paper Code: BSCPY 492

со	Description: After the completion of the course student will be able
CO1	Develop statistical knowledge
CO2	Use modern statistical technique
CO3	Apply statistical knowledge on Psychological research.

Paper Name: PRACTICAL BASED ON LIKERT'S SCALE AND GOODE AND HATTE'S REVISION OF BOGARDUS'S SCALE Paper Code: BSCPY 493

со	Description: After the completion of the course student will be able
CO1	Create questionnaires based on pre-established scales
CO2	Apply scaling techniques in psychological researches

Paper Name: UNDERSTANDING PSYCHOLOGICAL DISORDERS II Paper Code: BSCPY 501

со	Description: After the completion of the course student will be able
CO1	Define and Explain : Schizophrenia, Mental Retardation, Substance use, Psychophysiological disorders
CO2	Classify the different types of disorders
CO3	Sketch the clinical picture of the different types of disorders

CO4	Compare and Contrast the different perspectives of these
	disorders to arrive at a coherent etiology

Paper Name: DEVELOPMENTAL PSYCHOLOGY Paper Code: BSCPY 502

со	Description: After the completion of the course student will be able
CO1	Define and Explain the differences between maturity, growth, and development
CO2	Sketch the clinical picture of prenatal development and the hazards in it
CO3	Compare and Contrast the different approaches to human development across multiple domains.

Paper Name: **PRACTICAL ON PERSONALITY** Paper Code: **BSCPY 591**

со	Description: After the completion of the course student will
	be able

CO1	Use theoretical foundation of personality in clinical and non-clinical setting
CO2	Apply Personality tests to assess individual difference

Paper Name: Positive Psychology Paper Code: BSCPY503A

со	Description: After the completion of the course student will be able
CO1	Identify the basic premises of Positive Psychology, and analyze criticisms of the field.
CO2	Identify different ways to define and measure happiness, as well as variables that are related/unrelated to happiness and well-being.
CO3	Describe the history of Positive Psychology and its relationship to traditional psychology.
CO4	Identify the difference between values and character strengths. Use signature strengths in new ways.
CO5	Identify the components of enabling institutions.

CO6	Demonstrate comprehension of research and current theories in Positive Psychology.
CO7	Employ Positive Psychology interventions to increase personal well-being.

Paper Name: Cultural Psychology Paper Code: BSCPY503B

СО	Description: After the completion of the course student will be able
CO1	Explain the key psychological mechanisms that create cultural groups and identities along with the psychological processes that result from those groups and identities.
CO2	Describe applications of cultural psychology to personal and societal issues including (but not limited to) prejudice, discrimination, inequality, and acculturation.
CO3	Examine the role that cultural factors play in the creation, implementation, and interpretation of empirical psychological research.
CO4	Demonstrate understanding of and empathetic insight about diverse cultural groups at the local, national, and global levels.

CO5	Demonstrate effective scientific writing that communicates the
	understanding, application, and interpretation of cultural
	psychology principles and research.

Paper Name: Health Psychology Paper Code: BSCPY504A

со	Description: After the completion of the course student will be able
CO1	Describe the biopsychosocial model of health and other specific but related psychological theories
CO2	Develop an understanding of basic human biology such as the functioning of the endocrine, immune and nervous systems
CO3	Appreciate how a person's health can be affected by their behavior, given certain social factors, environments, and biological factors
CO4	Understand the effects of stress on a person's health and the role played by stress-buffering factors

Paper Name: Educational Psychology Paper Code: BSCPY504B

со	Description: After the completion of the course student will be able
CO1	Explains the meaning, scope and functions of concepts of education and psychology.
CO2	Explains the fundamentals of development.
CO3	Discusses the characteristics of physical development according to developmental periods.
CO4	Discusses cognitive development in terms of developmental periods.

Paper Name: ORGANIZATIONAL BEHAVIOR Paper Code: BSCPY 601

со	Description: After the completion of the course student will be able
CO1	Define and Explain the work done in the field of industrial and organizational psychology.

CO2	Use and implement different forms of organizational communication procedures.
CO3	Sketch the steps of personnel selection in an industry.

Paper Name: COUNSELLING PSYCHOLOGY Paper Code: BSCPY 602

СО	Description: After the completion of the course student will be able
CO1	Define and Explain the difference between guidance, counseling, and psychotherapy
CO2	Demonstrate the knowledge about the stages in the counseling process
CO3	Relate to the common attitudinal factors needed to be a good counselor
CO4	Compare and Contrast the different perspectives of counseling to arrive at a coherent orientation.

Paper Name: Human Resource Management

Paper Code: BSCPY603A

со	Description: After the completion of the course student will be able
CO1	Demonstrate an understanding of key terms, theories/concepts and practices within the field of HRM
CO2	Demonstrate competence in development and problem-solving in the area of HR Management
CO3	Provide innovative solutions to problems in the fields of HRM
CO4	Be able to identify and appreciate the significance of the ethical issues in HR

Paper Name: Engineering Psychology Paper Code: BSCPY603B

со	Description: After the completion of the course student will be able
CO1	Engineering Psychology majors graduate with an ability to write effectively and persuasively in the discourse of the discipline.

CO2	Engineering Psychology majors graduate with an ability to speak effectively and persuasively in the discourse of the discipline.
CO3	Engineering Psychology majors graduate with an ability to speak effectively and persuasively in the discourse of the discipline.
CO4	Engineering Psychology majors graduate with the interpersonal skills necessary to work one on one and in collaboration with others toward a common goal.

Paper Name: Community Psychology Paper Code: BSCPY604A

со	Description: After the completion of the course student will be able
CO1	student obtains an advanced understanding of relevant concepts, issues and work methods in community psychology.
CO2	understand of how to examine social and institutional framework conditions influence individuals, groups and organizations
CO3	Knowledge about and understanding of how to structure and document effective solutions on socio-political problems such as delinquency, homelessness, health promotion and accident prevention, unemployment, etc.
CO4	Knowledge about local community practices and about how to conduct interventions at the local community level.

Paper Name: Forensic Psychology Paper Code: BSCPY604B

СО	Description: After the completion of the course student will be able
CO1	Content, knowledge and theories: consistent with the standards of APA, AAA, and ASA
CO2	Critical thinking skills: analysis and synthesis of the research literature across the behavioral sciences including psychology, anthropology, and sociology
CO3	Communication: speaking and writing skills; technology literacy and research skills consistent with the standards of forensic psychology Conduct and write a review that summarizes part of the forensic psychology literature, applying fundamental strategies such as a thesis focus, an informative middle and an effective conclusion resulting from effective drafting, revising, and editing Use and define terms and concepts of the discipline and applying them appropriately, showing a strong & direct link between concepts and assigned reading

٠	Deliver effective oral presentations in a variety of
	communication settings, using standard diction of
	American English in a professional manner
	including dress and demeanor
•	Lead and participate effectively in group
	discussions, applying active listening skills and a
	respect for diverse views in interpersonal settings
٠	Select the most appropriate sources and databases
	for accessing and obtaining the needed information.
	Examines and compares information from various
	sources in order to ascertain the reliability, validity,
	accuracy, authority, timeliness, and point of view or
	bias of a given source.

Programme Name: B.Sc with Mathematics and Computer Applications Syllabus link: http://makautexam.net/aicte_details/SyllabusI/BSCBMC/AllSem20.pdf

Paper Name: Differential Calculus and Integral Calculus Paper Code: BMCA101

СО	Description: After the completion of the course student will be able
CO1	To provide understating of limit and continuity

CO2	To provide understanding of existence of n'th order derivative.
CO3	To find the radius of curvature in Cartesian form and in parametric form.
CO4	To apply the reduction formula to evaluate definite integral and to develop an understanding of Double and Triple Integrals.

Paper Name: Principles and Practices of Object Oriented Programming Paper Code: BMCA102

СО	Description: After the completion of the course student will be able
CO1	Understand several kind of basic statements and loops useful in OOPs.
CO2	Describe the procedural and Object Oriented Paradigm with concepts of streams, classes, functions, data and objects.
CO3	Understand dynamic memory management techniques using pointers, constructors, destructors, etc.
CO4	Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.

CO5	Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.
CO6	Demonstrate the use of various OOPs concepts with the help of programs.

Paper Name: English Paper Code: BMCA104

со	Description: After the completion of the course student will be able
CO1	To enable the learner to communicate effectively and appropriately in a real-life situation
CO2	To use English effectively for study purposes across the curriculum.
CO3	The course will enable the learner to develop and demonstrate the speaking skills for group discussions, Viva-voce, Personal interviews etc.
CO4	To use R, W, L, S and integrate the use of four language skills; Reading, Writing, Listening and Speaking.

Paper Name: Principles and Practices of Object Oriented Programming Lab Paper Code: BMCA191

со	Description: After the completion of the course student will be able
CO1	Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
CO2	Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc. and exception handling mechanisms.
CO3	Understand the principles of inheritance, packages and interfaces.

Paper Name: Differential Equations Paper Code: BMCA201

СО	Description: After the completion of the course student will be able
	be able

CO1	To use the method of integrating factors to solve linear, first-order DEs
CO2	To find the complete solution of a non-homogeneous differential equation.
CO3	To solve the first order differential equations using variable separable methods.
CO4	To introduce and solve linear Partial Differential with different methods.

Paper Name: Data Structures Paper Code: BMCA202

со	Description: After the completion of the course student will be able
CO1	Implement, analyze and determine the time and space complexity for a given problem of Array, Stack, Queue and Linked list.
CO2	Implement Tree and Graph and use them in solving a problem.
CO3	Write and implement an algorithm for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Linear Search,

	Binary Search and compare their performance in term of Space and Time complexity.
CO4	Identify appropriate data structure & algorithmic methods in problem solving.

Paper Name: Environmental Science Paper Code: BMCA204

со	Description: After the completion of the course student will be able
CO1	Gain in-depth knowledge on natural processes that sustain life, and govern the economy.
CO2	Predict the consequences of human actions on the web of life, global economy and quality of human life.
CO3	Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.
CO4	Acquire values and attitudes towards understanding complex environmental-economic social challenges, and participating actively in solving current environmental problems and preventing the future ones.

CO5	Adopt sustainability as a practice in life, society and industry.
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Paper Name: Data Structure Lab Paper Code: BMCA291

со	Description: After the completion of the course student will be able
CO1	To impart the basic concepts of data structures and algorithms.
CO2	To understand concepts about searching and sorting techniques.
CO3	To understand basic concepts about stacks, queues, lists, trees and graphs
CO4	To understand writing algorithms and step by step approach in solving problems with the help of fundamental data structures.

Paper Name: Real and Complex analysis Paper Code: BMCA301

со	Description: After the completion of the course student will be able
CO1	To expose the students to the basics of real analysis and to recognize convergent, divergent, bounded, Cauchy and monotone sequences
CO2	To define the real numbers, least upper bounds, and the triangle inequality, define functions between sets; equivalent sets; finite, countable and uncountable sets
CO3	To apply the concept of convergent and divergent series in different application-oriented fields
CO4	To analyse with functions (polynomials, reciprocals, exponential, trigonometric, hyperbolic) of single real/complex variable and its synthesis and describe mappings in the complex plane.

Paper Name: Numerical Analysis Paper Code: BMCA302

со	Description: After the completion of the course student will be able
CO1	To use several methods of solving algebraic and transcendental equations of one variable.

CO2	To approximate functions by polynomials.
CO3	To approximate differentiation & integration.
CO4	To solve IVP numerically.
CO5	To solve linear systems of equations.
CO6	To use iterative techniques to solve linear systems.

Paper Name: Design and Analysis of Algorithms Paper Code: BMCA303

со	Description: After the completion of the course student will be able
CO1	Analyze the worst-case running times of algorithms based on asymptotic analysis.
CO2	Model a problem and develop the appropriate algorithm from divide and conquer, greedy, dynamic programming and other paradigms.

CO3	Classify problems in appropriate complexity classes and apply
	approximation and randomized algorithms in solving computationally hard real life problems.

Paper Name: Analytical geometry Paper Code: BMCA305A

со	Description: After the completion of the course student will be able
CO1	To introduce the geometry of lines and conics in the Euclidean plane.
CO2	To develop geometry with a degree of confidence.
CO3	To gain fluency in the basics of Euclidean geometry.

Paper Name: Graph Theory Paper Code: BMCA305B

со	Description: After the completion of the course student will be able
CO1	To understand and apply the fundamental concepts in graph theory
CO2	To analyze network problems using the concepts of graph theory
CO3	To introduce the basics of graphs and combinatorial required for VLSI design and Optimization
CO4	To understand the various types of graph Algorithms and graph theory properties

Paper Name: Numerical Analysis Practical Paper Code: BMCA391

со	Description: After the completion of the course student will be able
CO1	To gain the basic knowledge of any one programming language of FORTRAN/ C/ C++/ Python/ MATLAB.
CO2	To co-relate with the theoretical and practical studies relate to Numerical Analysis.

CO3	To understand the limitations, advantages and disadvantages of different numerical method
CO4	To introduce the numerical techniques of solving algebraic and transcendental equations, solving system of linear equations and ordinary differential equations.
CO5	To acquaint the knowledge of various techniques of interpolation and numerical integration.

Paper Name: Design and Analysis of Algorithms Lab (Python) Paper Code: BMCA392

со	Description: After the completion of the course student will be able
CO1	Learn how to analyze a problem and design the solution for the problem.
CO2	Design and implement efficient algorithms for a specified application.
CO3	Strengthen the ability to identify and apply the suitable algorithm for the given real world problem.

Paper Name: Algebra Paper Code: BMCA401

со	Description: After the completion of the course student will be able
CO1	Recognize the concepts of the terms span, linear independence, basis, and dimension, and apply these concepts to various vector spaces and subspaces.
CO2	Use matrix algebra and the related matrices to linear transformations.
CO3	Find the eigenvalues and eigenvectors of a square matrix using the characteristic polynomial and use it to diagonalize a matrix.
CO4	Familiarization with group, ring and field.

Paper Name: Discrete Mathematics Paper Code: BMCA402

со	Description: After the completion of the course student will be able
CO1	Understand the basic principles of sets and operations in sets.

CO2	Apply counting principles to determine probabilities.
CO3	Formulate computational problems using trees and graphs.
CO4	Write an argument using logical notation and determine the validity of an argument.

Paper Name: Optimization Techniques Paper Code: BMCA403

со	Description: After the completion of the course student will be able
CO1	Explain the various fundamental concepts of the optimization theory.
CO2	Use concepts of mathematical properties to formulate an optimization problem.
CO3	Analyze and appreciate variety of performance measures for various optimization problems

Paper Name: Vector calculus

Paper Code: BMCA405A

со	Description: After the completion of the course student will be able
CO1	Memorize definition of directional derivative and gradient and illustrate geometric meanings with the aid of sketches.
CO2	Apply gradient to solve problems involving normal vectors to level surfaces.

Paper Name: Automata Paper Code: BMCA405B

со	Description: After the completion of the course student will be able
CO1	Write a formal notation for strings, languages and machines. Design finite automata to accept a set of strings of a language.
CO2	Design context free grammars to generate strings of context free language.
CO3	Determine equivalence of languages accepted by Push Down Automata and languages generated by context free grammars.

CO4	Distinguish between computability and non-computa Decidability and undecidability.	ability and

Paper Name: User interface and Web Development Paper Code: BMCA405C

со	Description: After the completion of the course student will be able
CO1	Understand the major areas and challenges of web programming.
CO2	Distinguish web-related technologies.
CO3	Use advanced topics in HTML5, CSS3, Java Script.
CO4	Use a server-side scripting language
CO5	Use a relational DBMS, MySQL.

Paper Name: Optimization Techniques Lab
Paper Code: BMCA491

со	Description: After the completion of the course student will be able
CO1	Learn efficient computational procedures to solve optimization problems.
CO2	Use different software to implement important optimization methods.
CO3	Use of different soft computing techniques for real life problem solving.

Paper Name: Theory of Probability and Stochastic Process Paper Code: BMCA501

со	Description: After the completion of the course student will be able
CO1	Understand probability distributions in the study of the joint behavior of two random variables.
CO2	Establish a formulation helping to predict one variable in terms of the other that is, correlation and linear regression.

CO3	Understand the central limit theorem, which establishes the remarkable fact that the empirical frequencies of so many natural populations exhibit a bell shaped curve.
CO4	Understand real life applications of Markov Chains, Chapman-Kolmogorov equations.

Paper Name: Operating System Paper Code: BMCA502

со	Description: After the completion of the course student will be able
CO1	Create processes and threads and analyze the concepts of processes and threads in the operating system and illustrate the scheduling of processors for a given problem instance.
CO2	For a given specification of memory organization, develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
CO3	Identify and handle deadlock related issues.
CO4	Understand the implement file systems and directories along with the interfacing of IO devices with the operating system and disk management.

Paper Name: Operating System Lab Paper Code: BMCA591

со	Description: After the completion of the course student will be able
CO1	Create processes and threads and analyze the concepts of processes and threads in the operating system and illustrate the scheduling of processors for a given problem instance.
CO2	For a given specification of memory organization, develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
CO3	Identify and handle deadlock related issues.
CO4	Understand the implement file systems and directories along with the interfacing of IO devices with the operating system and disk management.

Paper Name: Mathematical Methods Paper Code: BMCA601

со	Description: After the completion of the course student will be able
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CO1	Understand the theory and applications of integral transforms.
CO2	Explain how integral transforms can be used to solve a variety of differential equations.
CO3	Solve integro-differential equations of Fredholm and Volterra type.
CO4	Understand the properties of various kinds of integral equations.

Paper Name: Database Management System Paper Code: BMCA602

со	Description: After the completion of the course student will be able
CO1	Design the databases using the E-R diagram method and convert it into Relational Database.
CO2	Write relational algebra and Relational Calculus expressions for a given query and optimize the developed expressions.
CO3	Construct the SQL queries for Open source and Commercial DBMS for a given specification.

CO4	Optimize its execution using Query optimization algorithms for a given query.
CO5	Understand and implement transaction processing, concurrency control and Recovery systems.

Paper Name: Database Management System Lab Paper Code: BMCA691

со	Description: After the completion of the course student will be able
CO1	Design the databases using the E-R diagram method and convert it into Relational Database.
CO2	Write relational algebra and Relational Calculus expressions for a given query and optimize the developed expressions.
CO3	Construct the SQL queries for Open source and Commercial DBMS for a given specification.
CO4	Construct the SQL queries for Open source and Commercial DBMS for a given specification.
CO5	Understand and implement transaction processing, concurrency control and Recovery systems.

Programme Name: M.Sc in Applied Mathematics Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MSCAM/AllSem21.pdf

Paper Name: Real and Complex Analysis Paper Code: MS-AM101

со	Description: After the completion of the course student will be able
CO1	To expose the students to the basics of real analysis and to recognize convergent, divergent, bounded, Cauchy and monotone sequences.
CO2	To define the real numbers, least upper bounds, and the triangle inequality, define functions between sets; equivalent sets; finite, countable and uncountable sets.
CO3	Will perform basic mathematical operations (arithmetic, powers, roots) with complex numbers in Cartesian and polar forms.
CO4	Ability to analyze with functions (polynomials, reciprocals, exponential, trigonometric, hyperbolic) of single real/complex variable and its synthesis and describe mappings in the complex plane.

Paper Name: Applied Linear Algebra Paper Code: MS-AM102

со	Description: After the completion of the course student will be able
CO1	To gain computational techniques and algebraic skills essential for the study of systems of linear equations, matrix algebra, vector spaces, eigenvalues and eigenvectors, orthogonality and diagonalization.
CO2	To gain knowledge and ability for visualization, spatial reasoning, as well as geometric properties and strategies to model, solve problems, and view solutions, especially in R2 and R3, as well as conceptually extend these results to higher dimensions.
CO3	To learn analyzing and application of algorithms of linear algebra to data science and particularly in machine learning.
CO4	To use appropriate technology, to enhance and facilitate mathematical understanding of data with a view to analyze, as well as presenting acceptable solutions.

Paper Name: Classical Mechanics Paper Code: MS-AM103

со	Description: After the completion of the course student will be able

CO1	The students will be able to apply the Variational principles to real physical problems.
CO2	The students will be able to model mechanical systems, both in inertial and rotating frames, using Lagrange and Hamilton equations.
CO3	Students will know the concepts of classical mechanics and demonstrate a proficiency in the fundamental concepts in this area of science.
CO4	Students will be able to solve problems using their knowledge and skills in modern physics. They will use critical thinking skills to formulate and solve quantitative problems in applied physics.

Paper Name: Graph Theory and Graph Algorithms Paper Code: MS-AM104

со	Description: After the completion of the course student will be able
CO1	To understand and apply the fundamental concepts in graph theory
CO2	To apply graph theory-based tools in solving practical problems

CO3	To introduce the basics of graphs and combinatory required for VLSI design and Optimization
CO4	To understand the various types of graph Algorithms and graph theory properties
CO5	To distinguish the features of the various tree and matching algorithms
CO6	To analyze web data on information propagation.

Paper Name: Computer Programming with Python Paper Code: MS-AM105

со	Description: After the completion of the course student will be able
CO1	To Understand the principles of Python and acquire skills in programming in python.
CO2	Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.
CO3	To implement Python programs with conditionals and loops.

CO4	Represent compound data using Python lists, tuples, dictionaries, Files and modules.
CO5	To implement the python programming features in practical applications.
CO6	To develop the emerging applications of relevant fields using Python (Data Science).

Paper Name: Applied Linear Algebra and Graph Algorithms Lab (Using Python and MATLAB) Paper Code: MS-AM191

СО	Description: After the completion of the course student will be able
CO1	To apply different methods and techniques of linear algebra to determine eigenvalues and eigenvectors, factorization of matrices with relevant applications in Machine learning/Data Science.
CO2	To analyze different types of networks including electrical networks, distribution networks, social networks.
CO3	To implement available algorithms of graph theory and linear algebra.

Paper Name: Python Programming Lab Paper Code: MS-AM192

со	Description: After the completion of the course student will be able
CO1	To write, test, and debug simple Python programs.
CO2	To implement Python programs with conditionals and loops.
CO3	Use functions for structuring Python programs.
CO4	Represent compound data using Python lists, tuples, dictionaries.
CO5	Read and write data from/to files in Python.

Paper Name: Differential Equations with Boundary Value Problems C Paper Code: MS-AM201

СО	Description: After the completion of the course student will be able
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CO1	To identify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order and selected higher order ordinary differential equation.
CO2	To create and analyze mathematical models using higher order differential equations to solve application problems such as harmonic oscillators and circuits.
CO3	To determine fundamental solutions and independence using the Wronskian.
CO4	Able to find Series solutions, Laplace transform, Linear systems of ordinary differential equations.

Paper Name: Advanced Numerical Analysis and CFD Paper Code: MS-AM202

СО	Description: After the completion of the course student will be able
CO1	To learn various methods for the system of linear equations and eigenvalue problems.
CO2	To find the numerical solution of initial value and boundary value problems.

CO3	To get basic knowledge of governing equations for fluid flow (Navier-Stokes equations) and heat transfer (Energy equation).
CO4	To introduce basics of computational fluid dynamics via finite difference methods for incompressible viscous fluid flows.
CO5	To provide an introduction of the finite volume method.

Paper Name: Continuum Mechanics and Introduction to Fluid Dynamics Paper Code: MS-AM203

СО	Description: After the completion of the course student will be able
CO1	To familiarize with the properties of fluids and the applications of fluid mechanics.
CO2	To formulate and analyze problems related to calculation of forces in fluid structure interaction.
CO3	To understand the concept of fluid measurement, types of flows and dimensional analysis.

CO4	Demonstrate knowledge of the physical meanings, principles, and mathematics of continuous media represented as solids, liquids, and gasses.
CO5	Formulate and solve simplified problems using the language and methods of continuum mechanics. Be able to combine distinct concepts and to introduce reasonable assumptions when faced with ambiguity in data or instructions.

Paper Name: Abstract Algebra and Applications Paper Code: MS-AM204

со	Description: After the completion of the course student will be able
CO1	To introduce basic structures of algebra like groups, rings and fields which are the main pillars of modern mathematics.
CO2	To understand the concepts of homomorphism and isomorphism between groups.
CO3	To apply class equations and Sylow theorems to solve different problems.
CO4	To explore the properties of rings, sub-rings, ideals including integral domain, principle ideal domain, Euclidean ring and Euclidean domain.

CO5	To understand the concepts of homomorphism and isomorphism between rings.
CO6	To understand and apply field and field extensions for applications.

Paper Name: Research Methodology and IPR Paper Code: MS-AM205

СО	Description: After the completion of the course student will be able
CO1	To gain knowledge for an overview of the research methodology and ability to explore the technique of defining a research problem.
CO2	To learn the functions of the literature review in research and ability for carrying out a literature search, its review, developing theoretical and conceptual frameworks and writing a review.
CO3	To investigate various research designs and their characteristics and to explain the details of sampling designs, measurement and scaling techniques along with different methods of data collections.
CO4	To gain knowledge of various forms of the intellectual property, its relevance and business impact in the changing scenario of the global business environment.

Paper Name: Advanced Numerical Analysis Lab Paper Code: MS-AM291

со	Description: After the completion of the course student will be able
CO1	To understand analytical, developmental and technical principles that relate to Numerical Analysis.
CO2	Numerical Methods for solving Differential Equations, and Numerical Optimization, develop the academic abilities required to solve problems and applications in Numerical Analysis.
CO3	Numerical Optimization and critically assess relevant aspects of the industry.
CO4	To demonstrate an ability to initiate and sustain in-depth research in Numerical Analysis or Numerical Optimization.

Paper Name: Computational Fluid Dynamics Lab Paper Code: MS-AM292

СО	Description: After the completion of the course student will be able
CO1	To recognize the importance of CFD in Heat and Fluid flow
CO2	To analyze forced convection heat transfer coefficient over regular bodies like sphere, cylinder.
CO3	To estimation of drag coefficient in circular pipe under turbulent flow and bent pipe.
CO4	To recognize how to handle moving boundaries and wall effects in motion of fluid.
CO5	To analyze how to handle power law fluids in CFD.

Paper Name: Topology and Functional Analysis Paper Code: MS-AM301

со	Description: After the completion of the course student will be able
CO1	Impart the knowledge of topological and functional analysis methodologies.

CO2	Understand Open bases and open sub bases.
CO3	Learn the importance and characterization of compact space.
CO4	Learn Continuous linear transformations and the Hahn-Banach theorem.
CO5	Understand the Open Mapping Theorem and its applications.
CO6	Understand the characteristics of abstract analysis
C07	Apply the knowledge of basic linear operator theory.

Paper Name: Machine Learning Paper Code: MS-AM302

со	Description: After the completion of the course student will be able
CO1	To learn the concept of how to learn patterns and concepts from data

CO2	Understand applications of ML in various functional areas & industries.
CO3	To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
CO4	To explore supervised and unsupervised learning paradigms of machine learning.
CO5	To understand how reinforcement and evolutionary algorithms are used.
CO6	To explore Deep learning techniques and various feature extraction strategies.

Paper Name: Integral Transforms and Integral Equations Paper Code: MS-AM303

со	Description: After the completion of the course student will be able
CO1	To understand and apply the fundamental concepts integral transform
CO2	To understand the concept of Laplace transform, Fourier transform, Hankel transform, Mellin transform and Z transform.

CO3	To introduce the basics of integral equation
CO4	To understand the applications of mathematical transform
CO5	To understand the applications of integral equation.

Paper Name: Computational Biology Paper Code: MS-AM304

со	Description: After the completion of the course student will be able
CO1	To understand and apply the fundamental concepts of mathematics in biology
CO2	To apply mathematics in real life biological model
CO3	To introduce the computational methodology for biological problem
CO4	To understand the various types of bioinformatics model

CO5	To analyze and visualization of biological problem using
	programming language and different software

Paper Name: Machine Learning Lab Paper Code: MS-AM391

СО	Description: After the completion of the course student will be able
CO1	To introduce students to the basic techniques of Machine Learning.
CO2	To develop skills of using recent machine learning software for solving practical problems.
CO3	To enable the students to: state-of-the-art methods and modern programming tools for data analysis using machine learning programs and algorithms
CO4	To gain experience of doing independent study and research.

Paper Name: Differential Equation and Integral Transform Lab Paper Code: MS-AM392

со	Description: After the completion of the course student will be able
CO1	To present the foundations of many basic Mathematical tools and concepts related to Engineering.
CO2	To provide a coherent development to the students for the courses of various branches of Engineering like Control Theory, Circuits and Networks, Digital Logic design, Fluid Mechanics, Machine Design etc.
CO3	To enhance the student's ability to think logically and mathematically.
CO4	To give an experience in the implementation of Mathematical concepts which are applied in various field of Engineering.

Paper Name: Probability and Statistical Method Paper Code: MS-AM401

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CO1	To understand the axiomatic formulation of modern Probability Theory and think of random variables as an inherent need for the analysis of random phenomena.
CO2	To characterize probability models and function of random variables based on single & multiples random variables and their distributions.
CO3	To evaluate and apply moments & characteristic functions and understand the concept of inequalities and probabilistic limits.
CO4	To perform Test of Hypothesis as well as calculate confidence interval for a population parameter and to understand the concept of p-values.
CO5	To provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science like disease modeling, climate prediction and computer networks etc.

Paper Name: Operations Research: Optimization Techniques and Soft Computing Paper Code: MS-AM402

со	Description: After the completion of the course student will be able
CO1	To transform real life minima/maxima problems into optimization frameworks.

CO2	To learn efficient computational procedures to solve linear and non- linear optimization problems.
CO3	To acquire an idea about the various direct and indirect search methods.
CO4	To learn applicability of different queuing models in real life cases.
CO5	To learn the different soft computing techniques including Fuzzy logic and evolutionary algorithms.

Paper Name: Optimization Techniques and Soft Computing Lab Paper Code: MS-AM491

со	Description: After the completion of the course student will be able
CO1	Cast engineering minima/maxima problems into an optimization framework.
CO2	Learn efficient computational procedures to solve optimization problems
CO3	Use Matlab to implement important optimization methods.

CO4	Soft Computing Techniques to Improve Data Analysis Solutions is to strengthen the dialogue between the statistics and soft computing research communities.
CO5	Soft Computing is a consortium of methodologies which collectively provide a body of concepts and techniques for designing intelligent systems.

Programme Name: B.Sc in MATERIALS SCIENCE Syllabus link: http://makautexam.net/aicte_details/SyllabusI/BSCMS/AllSem20.pdf

Paper Name: Introduction to Materials Paper Code: BMS101

CO	Description: After the completion of the course student will be able
CO1	To know the evolution of materials science and understanding materials around us
CO2	Understanding the materials structure property relationship that are involved in the design, production, and utilization of materials
CO3	Be able to describe the electronic band structure of materials, free electron theory and able to describe the relation between electrical and thermal conductivity of materials

Paper Name: Macroscopic and Microscopic Examination of Materials Paper Code: BMS191

со	Description: After the completion of the course student will be able
CO1	Understands and Measure materials properties using experimental techniques

CO2	Relate the concepts learned with the functioning of everyday devices
CO3	Perform experiments based on electrical properties of materials
CO4	Able to demonstrate and apply the knowledge of thermal, electrical and mechanical properties of functional materials for development of newer systems

Paper Name: Classical Physics for Materials Science Paper Code: BMS102

со	Description: After the completion of the course student will be able
CO1	Solve the Newton equations for simple configurations using various methods & able to solve advanced problems involving the dynamic motion
CO2	Represent the equations of harmonic motion of oscillation with same phase difference or equal frequencies
CO3	Use conservation of energy and linear and angular momentum to solve dynamics problems

Paper Name: Communicative English Paper Code: BMS 104

СО	Description: After the completion of the course student will be able
CO1	Prepare themselves better for an interview in English. The three lessons will focus on improving your body language, pronunciation for -ed and -s ending words
CO2	Have the chance to put all your newly gained language skills together into a presentation. This module will teach the presentation skills
CO3	Speak English and Improve your pronunciation and fluency. Communicate in Person: The Power of Face to Face Connections

Paper Name: Materials Chemistry Paper Code: BMS201

со	Description: After the completion of the course student will be able
CO1	This course will introduce basic concepts of materials chemistry, synthesis, properties and applications of different types of materials.

CO2 It will discuss electrical properties of ionic solutions and helps i knowing the effect of electrochemical corrosion.	CO2	It will discuss electrical properties of ionic solutions and helps in knowing the effect of electrochemical corrosion.
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Paper Name: Materials Synthesis Lab Paper Code: BMS 291

СО	Description: After the completion of the course student will be able
CO1	Understands different materials structure property relationship
CO2	Perform experiment for materials synthesis
CO3	Perform experiments based on different properties of materials like electrical, chemical

Paper Name: Quantum Physics for Materials Science Paper Code: BMS 202

со	Description: After the completion of the course student will be able
CO1	Understand historical aspects of the development of quantum Physics for Materials Science.

CO2	Understand and explain the differences between classical and quantum mechanics.
CO3	Understand the central concepts and principles in quantum mechanics, such as the Schrodinger equation, the wave function and its statistical interpretation, the uncertainty principle, stationary and non-stationary states, time evolution of solutions, as well as the relation between quantum mechanics and linear algebra including understanding of elementary concepts in statistics, such as expectation values and variance. They will master the concepts of angular momentum and spin, as well as the rules for quantization and addition of these. Hence they will be able to solve the complex systems by approximation method.

Paper Name: Environment & Sustainability Paper Code: BMS204

со	Description: After the completion of the course student will be able
CO1	Describe the ways that sustainability topics are approached by a diversity of academic disciplines.
CO2	Articulate concepts of interdependence and dynamic interrelationships within and between social and ecological systems.
CO3	Evaluate how systemic limits and globalized processes impact socio ecological systems and impose social differences.

CO4	Integrate human and ecological health and social equity in problem solving strategies.
CO5	Generate creative responses that inform sustainable approaches to promote resilient communities.

Paper Name: Thermodynamics of Materials Paper Code: BMS 301

СО	Description: After the completion of the course student will be able
CO1	Use thermodynamic terminology correctly.
CO2	Explain fundamental thermodynamic properties.
CO3	Derive and discuss the first and second laws of thermodynamics.
CO4	Solve problems using the properties and relationships of thermodynamic fluids.
CO5	Analyze basic thermodynamic cycles.

CO6	Students must have an understanding of thermodynamic fundamentals before studying their application in applied thermodynamics.
CO7	The understanding of thermodynamic properties and processes will assist students in other related coursework.

Paper Name: Kinetics and Transport Phenomena of Materials Paper Code: BMS 302

СО	Description: After the completion of the course student will be able
CO1	An ability to design a system, component, or process to meet desired needs.
CO2	An ability to function on multi-disciplinary teams.
CO3	An ability to identify, formulate, and solve engineering problems.
CO4	An understanding of professional and ethical responsibility.
CO5	An ability to communicate effectively.

CO6	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
C07	A recognition of the need for, and an ability to engage in life-long learning.
CO8	A knowledge of contemporary issues.
CO9	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Paper Name: Introduction to Programming using Python Paper Code: BMS 391

со	Description: After the completion of the course student will be able
CO1	To Understand and discuss the basics of computer programming
CO2	To Understand the mathematical concepts of Python expressions
CO3	To Interpret the application of Python in stack and merging problem

CO4	To write program in using Python using inserting, deleting, inverting linked list
CO5	To Implement of linked lists: inserting, deleting, inverting a linked list

Paper Name: Structure of Materials Paper Code: BMS 303

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со	Description: After the completion of the course student will be able
CO1	Analyze the Structure of materials at different levels, basic concepts of crystalline materials like unit cell, FCC, BCC, HCP, APF (Atomic Packing Factor), Coordination Number etc.
CO2	Understand concept of mechanical behavior of materials and calculations of same using appropriate equations
CO3	Explain features, classification, applications of newer class materials like smart materials, piezoelectric materials, biomaterials, composite materials etc.

Paper Name: Audit Course Paper Code: BMS 306

СО	Description: After the completion of the course student will be able
CO1	Demonstrate the ability to choose methods appropriate to research aims and objectives
CO2	Understand the limitations of particular research methods
CO3	Develop skills in qualitative and quantitative data analysis and presentation
CO4	Develop advanced critical thinking skills
CO5	Demonstrate enhanced writing skills

Paper Name: Phase Equilibria and Phase Transformation Paper Code: BMS 401

со	Description: After the completion of the course student will be able

CO1	Describe the derivation of phase diagrams from the laws of thermodynamics, based on the concepts of Gibbs energy and chemical potentials.
CO2	Quantitatively describe equilibrium states using phase diagrams.
CO3	Use Gibbs energy curves and chemical potentials to describe the driving forces for diffusion and phase transformations.
CO4	Describe the microstructures to be expected for various material systems exhibiting, in particular complete solid solubility, eutectic, eutectoid and peritectic reactions.
CO5	Describe how atomic diffusion occurs in liquid and solid phases and how this controls the nucleation, growth and coarsening of phases.
CO6	Discuss the concept and applications of phase metastability.
C07	Use basic laboratory skills to study the microstructure of materials, be able to work effectively within a team in carrying out laboratory work, be able to keep appropriate laboratory records and develop skills to communicate the results and conclusions of practical work.

Paper Name: Intermediate Programming with Python Paper Code: BMS 491
со	Description: After the completion of the course student will be able
CO1	To Understand and discuss Operations, Working, Functions and Methods Dictionaries on fundamentals of function
CO2	To Understand the Global and local variables Modules Importing module
CO3	To Capable of searching and Sorting techniques
CO4	To Apply the fundamentals of python programming

Paper Name: Materials Behavior: Mechanical, Electrical & Magnetic Paper Code: BMS 402

со	Description: After the completion of the course student will be able
CO1	explain the importance of mechanical properties of materials and their industrial application for engineering design in the Materials Science and Engineering field.

CO2	express the information about fundamental conceptions of fracture mechanics with his/her own sentences.
CO3	evaluate mechanical behavior, measurements of mechanical properties and test methods.
CO4	demonstrate the improvements of strength and toughness of materials.
CO5	define thermal behavior and high temperature applications of materials.

Paper Name: Materials Behavior Lab Paper Code: BMS 492

со	Description: After the completion of the course student will be able
CO1	To understand analytical, developmental of material behavior in terms of electrical, optical characteristics
CO2	Experimentation of stress strain behavior of materials
CO3	Electrical characterization analyses of materials

CO4	Capable of applying magnetic characterization of testing	materials and
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Paper Name: Processing of Bulk Materials Paper Code: BMS 403

СО	Description: After the completion of the course student will be able
CO1	Identify and assimilate key information for the design of integrated bulk materials handling systems.
CO2	Apply specialist knowledge to an open ended design problem taken from real industrial scenarios.
CO3	Work with a range of information sources to find practical solutions to situations where a range of practical solutions are possible.
CO4	Apply fundamental concepts to the design of a dense phase pneumatic conveying system.
CO5	Apply fundamental concepts to the design of a major mechanical conveying system.

CO6	Demonstrate ability to write a high level professional Technical feasibility study.

Paper Name: Thin films and Nanomaterials Paper Code: BMS 501

со	Description: After the completion of the course student will be able
CO1	discuss the differences and similarities between different vacuum based deposition techniques
CO2	evaluate and use models for nucleating and growth of thin films
CO3	asses the relation between deposition technique, film structure, and film properties
CO4	Qualitatively describe how the nanoparticle size can affect the morphology, crystal structure, reactivity, and electrical properties Describe several synthesis methods for fabrication of inorganic nanoparticles, one-dimensional nanostructures (nanotubes, nanorods, nanowires), thin films, nanoporous materials, and nanostructured bulk materials, and also could describe how different lithography methods can be used for making nanostructures.

CO5	explain fundamental size-dependent physical and chemical properties of nanomaterials and central technological and medical applications.
CO6	have a theoretical background within synthesis/fabrication of nanomaterials which makes he/she prepared for later literature studies and laboratory work within the field Perform simple geometric calculations of surface energy, coordination number, and volume fraction related to nanoscale properties and synthesis, and also simple chemical calculations related to synthesis Use the acquired knowledge to evaluate which synthesis methods that can be best suited for fabricating nanostructured materials of various inorganic compounds (metals, semiconductors, oxides, fullerenes) and constructions of these Consider the basic ethical, health-related and environment-related concerns encountered with respect to nanoparticles and nanomaterials in general, with special emphasis on sustainability.

Paper Name: Nano Materials Lab Paper Code: BMS 591

СО	Description: After the completion of the course student will be able
CO1	To understand the analytical skill for synthesis of metal/metal oxide, polymer, composite etc
CO2	Experimentation on characterization of nanomaterials and fabrication

CO3	Electrical characterization analyses of materials
CO4	Capable of applying spectroscopic method of analyses for materials

Paper Name: Materials Behavior: Electronic and Optical Paper Code: BMS 502

со	Description: After the completion of the course student will be able
CO1	The knowledge of basic principles and applications of Electronics
CO2	Understand the difference between polar & Non-polar dielectric materials.
CO3	Understand the applications of op-amps i inverting and non inverting modes.
CO4	Understand basic concepts of optical fibers & applications part of optical fiber into communications systems
CO5	Study the theory and experiment of interference using air wedge, Newton's rings and Michelson interferometer.

Paper Name: Materials Behavior Lab-II Paper Code: BMS 592

СО	Description: After the completion of the course student will be able
CO1	To understand analytical, developmental of material behavior in terms of electrical, optical characteristics
CO2	Experimentation of I-V characterization of materials
CO3	Optical characterization and analyses of materials
CO4	Electronic/ characterization of materials and testing

Paper Name: Materials Characterization Paper Code: BMS 601

со	Description: After the completion of the course student will be able
CO1	Understand and discuss the basic principles of advanced characterisation techniques (e.g. electronic microscopy, atomic force microscopy);

CO2	Explain and correlate the structure-property of materials at the nanoscale by different characterisation techniques;
CO3	Define the basic properties and characteristics of materials by analyzing their properties through a set of characterisation techniques;
CO4	Discuss the basic principles of advanced characterisation techniques;
CO5	Apply and select appropriate techniques for characterizing specific chemical and physical properties of materials;
CO6	Demonstrate the basic aspects of advanced materials and their applications, such as electronic materials, optical materials, magnetic materials, biomaterials.

Paper Name: Materials Characterization Lab Paper Code: BMS 692

СО	Description: After the completion of the course student will be able
CO1	To understand analytical, developmental of material characterization in terms of electrical, optical, mechanical characteristics
CO2	Capable on experimentation of thermal analyses of materials

CO3	Capable on experimentation on X-Ray diffraction, microscopic and mechanical properties of materials
CO4	Electronic/ electrochemical characterization of single cells

Paper Name: Design and Selection of Materials Paper Code: BMS 602

СО	Description: After the completion of the course student will be able
CO1	demonstrate how performance indexes based on mechanics analyses can be overlaid on material property charts to identify promising materials for specific applications using both manual and computer techniques.
CO2	construct and use material property charts to identify a small set of materials meeting mechanical, physical, and cost requirements.
CO3	use material processing charts to select suitable fabrication processes.
CO4	construct a translation table for problems involving either multiple constraints or conflicting objectives, and systematically identify candidate materials.

CO5	show that they can conceive hybrid material solutions that fill "white spaces" on the material property charts.
CO6	demonstrate an understanding of the methodologies used in materials design.

Programme Name: B. Sc. In Robotics & Robot process automation Syllabus link: http://makautexam.net/aicte_details/SyllabusI/BSCRRPA/AllSem22.pdf

Paper Name: Basic Electrical Engineering Paper Code: RB-EE 101

со	Description: After the completion of the course student will be able
CO1	Classification of Electrical Elements and Energy Sources.
CO2	Solve simple DC Circuits and Network Theorems.
CO3	Analyze RLC Combination in Time Domain.
CO4	Specify a Sinusoidal Waveform with drawing phasor diagram.
CO5	Classify Power and determine Power Factor.
CO6	Solve AC RLC Series-Parallel Combination problems.
C07	Analyze Three Phase balanced circuits.

CO8	Specify in detail ideal and practical transformers.
CO9	Calculate parameters of transformers.
CO10	Performance and application of Autotransformer and three phase connections.
CO11	Concept of generation of magnetic field.
CO12	Calculate parameters of Three Phase Induction Motor and analyze performance.
CO13	Calculate parameters of Single Phase Induction Motor and analyze performance.
CO14	Calculate parameters of Single Phase Induction Motor and analyze performance.
CO15	Calculate parameters of Synchronous Generator and analyze performance.
CO16	Classify Power Converters and analyze performance of power converters.

CO17	Identification of LT Switchgear, Circuit Breaker and Earthing and their application.
CO18	Identify Wires and Cables.
CO19	Calculate parameters of Battery and its performance analysis.

Paper Name: Engineering Graphics Paper Code: RB-MS191

со	Description: After the completion of the course student will be able
CO1	Familiarize yourself with the fundamentals and standards of Engineering graphics.
CO2	perform freehand sketching of basic geometrical constructions and multiple views of objects.
CO3	Project orthographic projections of lines and plane surfaces.
CO4	Draw projections and solids and development of surfaces.

CO5	visualize and to project isometric and perspective sections of simple solids.
CO6	Ability to visualize the pictorial view and draw orthographic projection on reference planes including sections by using AutoCAD.
C07	Ability to draw 2D & 3D Objects in Autocad.

Paper Name: Basic Electrical Engineering Lab Paper Code: RBEE191

со	Description: After the completion of the course student will be able
CO1	Use Electrical Elements and Measuring Instruments.
CO2	Measure Time Response of RLC Circuits and Resonance.
CO3	Analyze performance of Single Phase and three phase Transformer.
CO4	Evaluation of operation of (a) DC-DC converter (b) DC-AC converter (c) DC-AC converter for speed control of an Induction motor

CO5	Determination of Torque –Speed characteristics of separately
	excited DC motor and induction motor

Paper Name: Engineering Mechanics Paper Code: RBMS 101

СО	Description: After the completion of the course student will be able
CO1	Draw free body diagrams and determine the resultant of forces and/or moments.
CO2	Analyze the rigid body in equilibrium.
CO3	Determine the centroid and second moment of area of sections.
CO4	Apply laws of mechanics to determine efficiency of simple machines with consideration of friction.
CO5	Analyze the motion and calculate trajectory characteristics.
CO6	Determine the friction force and the effects by the use of laws of friction, also determine the Rolling resistance and Translation and Rotation of the Rigid Bodies.

Paper Name: Communicative English Paper Code: RB-HU 101

со	Description: After the completion of the course student will be able
CO1	Comprehend conversations and short talks delivered in English
CO2	Write short essays of a general kind and personal letters and emails in English
CO3	Prepare technical reports and short essays.
CO4	Students will be able to Learn basic do's and don'ts of an interview.
CO5	Students will be able to speak in English.

Paper Name: Analog & Digital Electronics Paper Code: RBEE201

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со	Description: After the completion of the course student will be able

CO1	Realize the basic operations of different analog components.
CO2	Realize basic gate operations and laws Boolean algebra.

Paper Name: Analog & Digital Electronics lab Paper Code: RBEE291

со	Description: After the completion of the course student will be able
CO1	Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.
CO2	Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
CO3	Apply basic equation of simple torsion in designing of shafts and helical spring.
CO4	Calculate the slope and deflection in beams using different methods.
CO5	Analyze and design thin and thick shells for the applied internal and external pressures.

Paper Name: Strength of Materials for Mechanical Engineers Paper Code: RB-MS201

со	Description: After the completion of the course student will be able
CO1	Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.
CO2	Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
CO3	Apply basic equation of simple torsion in designing of shafts and helical spring
CO4	Calculate the slope and deflection in beams using different methods.
CO5	Analyze and design thin and thick shells for the applied internal and external pressures.

Paper Name: Strength of Materials for Mechanical Engineers Lab Paper Code: RB-MS291

CO1	Analyze the tensile and compressive strength of a specimen for applying in a practical design based project work.
CO2	Determine the hardness, impact strength, fatigue strength to analyze the application of a specific material for a given design requirements for different loading conditions of structures or machines.
CO3	Understanding the bending in beams and to analyze the bending stresses which further build the foundation of using modern analysis software.
CO4	Evaluate the capacity of a material to withstand torsional stresses for a safe and sustainable design of machine elements.

Paper Name: Environmental Science Paper Code: RB-PR 201

со	Description: After the completion of the course student will be able
CO1	Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environment. One will obtain knowledge on the following after completing the course.
CO2	Public awareness of the environment is at an infant stage.

CO3	Ignorance and incomplete knowledge has lead to misconceptions
CO4	Development and improvement in std. of living has lead to serious environmental disasters

Paper Name: Electrical Machines Paper Code: RBEC301

со	Description: After the completion of the course student will be able
CO1	Understanding the principles of operations and characteristics of DC machines
CO2	Knowledge of electrical transformers and induction motors
CO3	Know about the different types of induction motors
CO4	Able to visualize the operation of synchronous motors stepper and servo motors.
CO5	Comprehending the power transmission and distribution systems

Paper Name: Electrical Machines Lab Paper Code: RBEC391

со	Description: After the completion of the course student will be able
CO1	Knowledge about the basic operation of electrical machines and help them to develop experimental skills.
CO2	Ability to verify the circuit laws and theorems and measure the circuit parameter.
CO3	Ability to operate electrical machines.
CO4	Ability to construct a Single Phase ,Three Phase Induction Motor with Loading Arrangement and to operate switches
CO5	Ability to determine the equivalent circuit parameters.

Paper Name: Microprocessors, Embedded Controllers and Real time Operating Systems Paper Code: RB-EC301

со	Description: After the completion of the course student will be able

CO1	Design and implement programs on 8085 microprocessor.
CO2	Design and implement programs on 8086 microprocessors.
CO3	Design I/O circuits.
CO4	Design Memory Interfacing circuits.
CO5	Design and implement 8051 microcontroller based systems.

Paper Name: Microprocessors, Embedded Controllers and Real time Operating Systems lab Paper Code: RBEC392

со	Description: After the completion of the course student will be able
CO1	The students be able to understand the basic knowledge of kinematics of machines
CO2	Students can able to apply fundamentals of mechanism for the design of new mechanisms

CO3	Able to know about the linkages, design few linkage mechanisms and cam mechanisms for specified output motions.
CO4	Impart knowledge about the gears and gear trains.
CO5	Ability to analyze them for optimum design.

Paper Name: Kinematics & Dynamics of Machines Paper Code: RBMS301

со	Description: After the completion of the course student will be able
CO1	The students be able to understand the basic knowledge of kinematics of machines
CO2	Students can able to apply fundamentals of mechanism for the design of new mechanisms

CO3	Able to know about the linkages, design few linkage mechanisms and cam mechanisms for specified output motions.
CO4	Impart knowledge about the gears and gear trains.

Paper Name: Kinematics & Dynamics of Machines Lab Paper Code: RB-MS 391

со	Description: After the completion of the course student will be able
CO1	Ability to demonstrate the principles of kinematics and dynamics of machinery
CO2	Ability to use the measuring devices for dynamic testing.

Paper Name: Introduction to python Paper Code: RBCS301

СО	Description: After the completion of the course student will be able
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CO1	Motivation for Computing
CO2	Welcome to Programming
CO3	Variables and Expressions : Design your own calculator
CO4	Loops and Conditionals : Hopscotch once again
CO5	Lists, Tuples and Conditionals : Let's go on a trip
CO6	Abstraction Everywhere : Apps in your phone
CO7	Counting Candies : Crowd to the rescue
CO8	Birthday Paradox : Find your twin
CO9	Google Translate : Speak in any Language

CO10	Currency Converter : Count your foreign trip expenses
CO11	Monte Hall : 3 doors and a twist
CO12	Sorting : Arrange the book

Paper Name: Power Electronics and Drives Paper Code: RB-EE401

со	Description: After the completion of the course student will be able
CO1	Ability to explain various devices and their structure, operating characteristics in the field of electronics.
CO2	Ability to classify, analyze and design, Control rectifier, chopper and inverter.
CO3	Will have ability to apply power electronic circuits for the control of popular applications.
CO4	Exposure to design and analyze PE circuits using simulation software.

Paper Name: Power Electronics & Drives Lab Paper Code: RB-EE491

со	Description: After the completion of the course student will be able
CO1	Ability to practice and understand converter and inverter circuits and apply software for engineering problems.
CO2	Ability to experiment about switching characteristics of various switches.
CO3	Ability to analyze AC to DC converter circuits.
CO4	Ability to analyze DC to AC circuits.
CO5	Ability to acquire knowledge on AC to AC converters
CO6	Ability to acquire knowledge on simulation software.

Paper Name: Sensors and Instrumentation Paper Code: RB-EC401

со	Description: After the completion of the course student will be able
CO1	Familiar with various calibration techniques and signal types for sensors.
CO2	Apply the various sensors in the Automotive and Mechatronics applications
CO3	Describe the working principle and characteristics of force, magnetic and heading sensors.
CO4	Understand the basic principles of various pressure and temperature, smart sensors.
CO5	Ability to implement the DAQ systems with different sensors for real time applications.

Paper Name: Sensors & Instrumentation Lab Paper Code: RB-EC491

со	Description: After the completion of the course student will be able
CO1	To discuss role of Sensor in instrumentation

CO2	To discuss bimetallic and temperature measurement systems.
CO3	To discuss Sensors & Instrumentation in detail.

Paper Name: Principles of Robotics I Paper Code: RBPR401

со	Description: After the completion of the course student will be able
CO1	Ability to understand basic concepts of robotics.
CO2	To analyze Instrumentation systems and their applications to various
CO3	To analyze Instrumentation systems and their applications to various
CO4	To know about the various path planning techniques.
CO5	To know about the dynamics and control in robotics industries.

Paper Name: Principle Robotics Lab I Paper Code: RBPR491

СО	Description: After the completion of the course student will be able
CO1	Use of any robotic simulation software to model the different types of robots and calculate work volume for different robots

Paper Name: Control System Paper Code: RB-EE501

со	Description: After the completion of the course student will be able
CO1	To unTo expose students to the state space representation and its analysis. understand the basic of the control system
CO2	Ability to know about the time and frequency domain analysis
CO3	To know about the different stability of the systems

CO4	To expose students to the state space representation and its analysis.
CO5	To introduce non-linear systems and their control and to impart knowledge on advanced control techniques

Paper Name: Control System Lab Paper Code: RBEE591

со	Description: After the completion of the course student will be able
CO1	Identify appropriate equipment and instruments for the experiment.
CO2	Test the instrument for application to the experiment.
CO3	Construct circuits with appropriate instruments and safety precautions.
CO4	Use MAT-Lab control system toolbox, MAT-Lab- simulink toolbox & PSPICE for simulation of systems.
CO5	Determine Control system specifications of first and second order systems.

Paper Name: Introduction to Robotics II Paper Code: RB-PR501

со	Description: After the completion of the course student will be able
CO1	Explain the basic concepts of working of robot
CO2	Analyze the function of sensors in the robot
CO3	Write program to use a robot for a typical application
CO4	Use Robots in different applications
CO5	Know about humanoid robots.

Paper Name: Robotics II Lab Paper Code: RB-PR592

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со	Description: After the completion of the course student will be able
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CO1	understand the fundamentals of autonomous robot operation, and
	be able to program a robot to read from its sensors and perform
	simple (hard-coded and learned) tasks.

Paper Name: 3D Printing Paper Code: RBPR601

со	Description: After the completion of the course student will be able
CO1	Develop CAD models for 3D printing.
CO2	Import and Export CAD data and generate .stl file.
CO3	Select a specific material for the given application.
CO4	Select a 3D printing process for an application.
CO5	Produce a product using 3D Printing or Additive Manufacturing (AM).

Paper Name: 3D Printing Lab Paper Code: RBPR691

СО	Description: After the completion of the course student will be able
CO1	To create a bot using recorders (Smart, Web and Screen).
CO2	To create a bot using command library – (Loop Command).
CO3	To create a bot to invoke database automation
CO4	To create a bot for automating excel operations
CO5	To create a bot for PDF Integrations.
CO6	To create a bot and working on error handling.
CO7	To create a bot develop using Object Cloning Command.
CO8	FTP and PGB Command Execution by Bots

CO9	MetaBot Designing with AI Sense.

Paper Name: Machine Vision Paper Code: RBCS601

со	Description: After the completion of the course student will be able
CO1	Knowledge or gadgets of vision systems
CO2	Ability to understand the image capturing and processing techniques
CO3	Ability to apply the vision system in other machines
CO4	Knowledge for recognizing the objects.
CO5	Knowledge in application of vision and image processing in robot operations.

Paper Name: Machine Vision Lab Paper Code: RBCS691

СО	Description: After the completion of the course student will be able
CO1	Understand the mathematical and statistical perspectives of machine learning algorithms through python programming.
CO2	Design and evaluate the unsupervised models through python in built functions.
CO3	Evaluate the machine learning models pre-processed through various feature engineering algorithms by python programming.
CO4	Design and apply various reinforcement algorithms to solve real time complex problems.
CO5	Design and develop the code for recommender system using Natural Language processing
CO6	Understand the basic concepts of deep neural network models and design the same.
Programme Name: B.Sc. in Forensic Science Syllabus link: http://makautexam.net/aicte_details/SyllabusI/BSCFS/AllSem20.pdf

Paper Name: Introduction to Forensic Science Paper Code: BSFS – 101

СО	Description: After the completion of the course student will be able
CO1	To memorize the history of forensic science in India and abroad and also understand its development.
CO2	To recognise various forensic science institutions in India and understand their organizational setup
CO3	To distinguish the various disciplines in forensic science and relate to the roles and responsibilities for forensic scientists
CO4	To understand the services of forensic science laboratories and the method of forensic report writing.

Paper Name: Crime, Criminology and Society Paper Code: BSFS – 102

со	Description: After the completion of the course student will be able
CO1	To appraise the fundamental concepts related to crimes in society

CO2	To understand the theories and concepts of criminology
CO3	To relate to the societal aspect associated with commission of crime.
CO4	To interpret the various concepts and techniques involved in criminal justice system

Paper Name: Laboratory – 1 – Forensic Science Paper Code: BSFS – 191

со	Description: After the completion of the course student will be able
CO1	To list the examples of crime cases in which apprehension arose because of Daubert standards.
CO2	To interpret code of conduct of forensic scientists in various establishments
CO3	To examine, analyze and interpret the roles and working of various institutions such as CFSLs, CFPB, BPR&D, Police Academy and Police Training Schools etc.
CO4	To analyze and interpret various types of crime case studies.

Paper Name: Laboratory – 2 – Crime Scene Paper Code: BSFS – 192

со	Description: After the completion of the course student will be able
CO1	To appraise the different concepts associated with criminal behavior, crime and victimology.
CO2	To examine and review the police system in India.
CO3	To appraise and associate the societal aspects of crime
CO4	To analyze and interpret various types of crime case studies.

Paper Name: English Communication Paper Code: BSFS 181

СО	Description: After the completion of the course student will be able
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CO1	develop command in Understanding concepts of English grammar & vocabulary in communication.
CO2	perceive comprehensive facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating the main ideas given in written texts
CO3	apply acquired linguistic knowledge in producing various types of written texts.
CO4	interpret facts and ideas from aural inputs and Apply acquired linguistic knowledge in giving spoken response.
CO5	choose different processes of listening & strategies of effective listening to be a good speaker

Paper Name: Forensic Law Paper Code: BSFS – 201

со	Description: After the completion of the course student will be able
CO1	To understand crime, criminal law and criminal courts

CO2	To relate the laws of IEA, IPC and CrPC.
CO3	To recognise the constitutional rights in India
CO4	To interpret laws associated with socio-economic and environmental crimes

Paper Name: Forensic Psychology Paper Code: BSFS – 202

со	Description: After the completion of the course student will be able
CO1	To understand the fundamental concepts of forensic psychology
CO2	To analyse criminal behaviour and relate to psychological concepts for interpretation
CO3	To recognise the tools and techniques of detecting deceptions

CO4	To interpret the legal aspects associated with psychological
	interpretations and techniques in the court of law

Paper Name: Laboratory – 3 – Forensic Law (Acts and Proceedings) Paper Code: BSFS – 291

СО	Description: After the completion of the course student will be able
CO1	To prepare schedules of offenses recognised under various Acts in India
CO2	To analyze cases in relation to various social and environmental crimes in India
CO3	To interpret various legal provisions associated with Indian Legal System

Paper Name: Laboratory – 4 – Forensic Psychology Paper Code: BSFS – 292

со	Description: After the completion of the course student will be able
CO1	To analyze various criminal cases studies in relation to offenses under psychological issues.

CO2	To review criminal cases pertaining to psychic behavior
CO3	To prepare report on the basis of case study analysis of different criminal cases dealing with psychological traits

Paper Name: Environmental Science Paper Code: BSFS – 281

со	Description: After the completion of the course student will be able
CO1	To gain knowledge about the environment and ecosystem.
CO2	To learn about natural resources, its importance and environmental impacts of human activities on natural resources.
CO3	To understand the conservation of biodiversity and its importance
CO4	To study environmental pollution, its impact on human and ecosystem and control measures.
CO5	To study the increase in population growth and its impact on environment

Paper Name: Forensic Dermatoglyphics Paper Code: BSFS – 301

со	Description: After the completion of the course student will be able
CO1	To understand the concepts for fingerprinting for forensic investigations
CO2	To interpret various collections and developments of impressions including fingerprints
CO3	To classify various types of impressions including lip print, ear print, foot print and others for forensics studies.
CO4	To relate different impressions that are encountered in various crime scene investigations

Paper Name: Technological Methods in Forensic Science Paper Code: BSFS – 302

СО	Description: After the completion of the course student will be able

CO1	To understand the fundamentals of electrophoresis Thin Layer Chromatography, Gas Chromatography and Liquid Chromatography etc. and their use in forensic investigation.
CO2	To relate to the concept of UV-VIS spectroscopy, Infrared spectroscopy, Atomic Absorption Spectroscopy, Atomic Emission Spectroscopy etc. which are widely used in forensic investigation.
CO3	To understand various microscopic methods e.g. Compound microscopy, Scanning Electron Microscopy etc. and their significance in studying trace evidence, collected from the place of crime.
CO4	To understand the usefulness of photography and videography in recording the crime scenes.

Paper Name: Criminalistics Paper Code: BSFS – 303

со	Description: After the completion of the course student will be able
CO1	To understand the various concepts related to crime scene management
CO2	To classify the different types of crime scene and crime scene evidence

CO3	To relate and appraise the different collection and preservation of physical evidence such as glass, soil, paint, fiber, cloth, tool mark etc.
CO4	To interpret the various analytical techniques utilized for examination of physical evidence.

Paper Name: Laboratory – 5 – Forensic Dermatoglyphics Paper Code: BSFS – 391

со	Description: After the completion of the course student will be able
CO1	To record fingerprints and footprints using different scientific techniques.
CO2	To classify 10 digit fingerprints.
CO3	To examine, analyze and interpret different features associated with fingerprints.
CO4	To interpret applications of different light sources as used in fingerprint development for forensics investigations

со	Description: After the completion of the course student will be able
CO1	To determine the concentration of coloured compound using colorimetric technique
CO2	To recall TLC, paper chromatography and implement it in distinguishing ink samples, organic materials
CO3	To apply UV – Vis Spectroscopy and identify various drug samples
CO4	To relate photography techniques and implement in crime scene investigation
CO5	To prepare forensic report

Paper Name: Introduction to Biometry Paper Code: BSFSSEC – 305

со	Description: After the completion of the course student will be able
CO1	To classify the fundamentals of biometric systems in relation to forensic investigations.

CO2	To analyze the concepts that are governing physiological biometrics
CO3	To relate the concepts those are governing behavioral biometrics
CO4	To interpret different analytical techniques that are applied in biometric systems.

Paper Name: Forensic Toxicology Paper Code: BSFS – 401

со	Description: After the completion of the course student will be able
CO1	To know the significance of toxicological studies in forensic science.
CO2	To understand the classification of different types of poisons and their modes of action.
CO3	To perceive the knowledge of how body fluids absorb poisons when introduced.
CO4	To know the procedure of the forensic identification of illicit liquors.

CO5	To apprehend the knowledge of the classification and characteristics of narcotics, drugs and psychotropic substances.
CO6	To understand the methods of identifying and purifying narcotics, drugs and psychotropic substances.

Paper Name: Forensic Chemistry Paper Code: BSFS – 402

со	Description: After the completion of the course student will be able
CO1	To understand about the chemistry of petroleum & related products in forensic aspects
CO2	To classify the explosives, including the synthesis and characterization of representative analogs
CO3	To learn the analysis of traces of petroleum products in forensic exhibits
CO4	To acquire knowledge on the cases involving Arson
CO5	To gain the techniques for scientific investigations related to Arson & Explosives

Paper Name: Forensic Biology Paper Code: BSFS – 403

со	Description: After the completion of the course student will be able
CO1	To recognise the importance and significance of biological evidence in criminal investigations
CO2	To identify various biological evidence encountered in criminal investigations
CO3	To relate to wildlife forensic and its associated crimes
CO4	To understand the fundamental concepts of forensic entomology

Paper Name: Laboratory – 7 – Toxicology & Biology Paper Code: BSFS – 491

со	Description: After the completion of the course student will be able
CO1	To identify biocides, metallic poisons, organic poisons, various alcohols etc. through laboratory experiments.

CO2	To carry out quantitative estimation of alcohols and drugs
CO3	To perform color tests, thin layer chromatography, spot test etc
CO4	To examine human hair for cortex and medulla
CO5	To prepare a case report on problems related to forensics analysis.

Paper Name: Laboratory – 8 – Chemistry & Handwriting Paper Code: BSFS – 492

со	Description: After the completion of the course student will be able
CO1	To know the procedure to analyze different petroleum fractions e.g. kerosene, diesel, gasoline etc.
CO2	To understand and analyze arson accelerators.
CO3	To know how to prepare a case report involving the use of arson

CO4	To know how to carry out analysis of explosive substances.
CO5	To gain knowledge about the separation and identification of explosive substances using thin-layer chromatography.
CO6	To know how to prepare a case report on bomb scene management.

Paper Name: Handwriting and its identification and recognition Paper Code: BSFSSEC – 405

со	Description: After the completion of the course student will be able
CO1	To infer and recognize the basics of handwriting characteristics identification, & the Factors influencing it.
CO2	To interpret and examine the types of disputed documents & handwriting comparison.
CO3	To classify the applications of handwriting recognition.

CO4	To understand the significance of forensic documentation.

Paper Name: Questioned Documents Paper Code: BSFS – 501

со	Description: After the completion of the course student will be able
CO1	To understand the fundamental concepts of questioned documents
CO2	To interpret the various analytical techniques applied in examination of questioned documents
CO3	To relate to the various concepts associated with examination of handwritings
CO4	To appraise the various types of forgeries
CO5	To recall the examination of various items in the spectrum of questioned documents

Paper Name: Forensic Ballistics Paper Code: BSFS – 502

СО	Description: After the completion of the course student will be able
CO1	To understand different types of firearms and their function commonly used in crime as well as propellants and the process of burning which helps to understand interior ballistics of firearms and their performance.
CO2	To evaluate the trajectory of projectile and various trajectory parameters useful for exterior ballistics work in particular reconstruction of shooting incidents in long range firings
CO3	To understand usefulness of automated system of trajectory computation and management of ballistic databases for evaluation of forensic problems related to exterior ballistics (including wound ballistics and terminal ballistics)
CO4	To reconstruct shooting incidents on Ricochet projectiles and identification of targets for different firearm ammunition combinations and identify firearms, ammunition and linkage of firearms with respect to fired cartridge case bullets.
CO5	To relate the importance of firearm signature on fired cartridge case and projectiles for linkage firearms, GSR analysis and firearms injuries for identification of shooter and estimation of range of fire and reconstruction purposes and also to distinguish the suicide and murder or cause by accident of firing.

Paper Name: Laboratory – 9 – Questioned Documents & Ballistics Paper Code: BSFS – 591

со	Description: After the completion of the course student will be able
CO1	To examine and differentiate between hand writings of different individuals.
CO2	To analyze and examine different types of forgeries
CO3	To interpret the various security features of Indian currency and Indian Passport
CO4	To analyze various case studies in relation to different sections of IEA and IPC

Paper Name: Laboratory – 10 – Ballistics Paper Code: BSFS – 592

со	Description: After the completion of the course student will be able
CO1	To appraise the knowledge regarding different types of firearms

CO2	To interpret and calculate the range of fired bullets and velocity of bullet on impact
CO3	To compare fired bullets and cartridge cases
CO4	To correlate the nature of injuries with the firing distance of bullets.

Paper Name: Forensic Medicine Paper Code: BSFS – 601

со	Description: After the completion of the course student will be able
CO1	To relate to the protocols of crime scene management in case of death of a human
CO2	To understand forensic pathology and interpret the medico-legal aspects of various modes of death
CO3	To understand the fundamental concepts of forensic odontology
CO4	To interpret the use of forensic odontology in criminal investigation

Paper Name: Forensic Anthropology Paper Code: BSFS – 602

со	Description: After the completion of the course student will be able
CO1	To understand the basics of forensic anthropology
CO2	To appraise somatoscopy and somatometry in forensic perspective
CO3	To interpret the somatoscopic and craniometric methods implemented in facial reconstruction
CO4	To relate to the applications of forensic anthropology in investigations

Paper Name: Laboratory – 11 – Forensic Medicine Paper Code: BSFS – 691

со	Description: After the completion of the course student will be able
CO1	To prepare documentations for crime scenes involving death

CO2	To analyze bite marks
CO3	To appraise the protocols of crime scene management

Paper Name: Laboratory – 12 – Forensic Anthropology Paper Code: BSFS – 692

со	Description: After the completion of the course student will be able
CO1	To perform various age and sex determination techniques on human skeleton
CO2	To apply identifications techniques for species determination of bones
CO3	To perform somatometric measurements on living subjects
CO4	To examine long bones for stature estimation
CO5	To conduct Portrait Parle using identification kit

Program Name: M.Sc. in Forensic Science

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MSCFS/AllSem20.pdf

Paper Name: Introduction to Forensic Science and Criminal Justice System Paper Code: MSFS-101

со	Description: After the completion of the course student will be able
CO1	To recall the fundamentals of forensic science and the need and importance of forensic scientists
CO2	To understand the basic pillars of judiciary system and the basics of criminal justice system
CO3	To interpret the legislations associated with various disciplines of forensic science
CO4	To appraise the different psychological techniques in criminal investigation and their legal implications

Paper Name: Analytical Instruments and Techniques Paper Code: MSFS-102

СО	Description: After the completion of the course student will be able
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CO1	To understand the basic concept of method validation, various spectroscopic & microscopic techniques.
CO2	To learn the analytical techniques and methods involved in the analysis of forensic samples
CO3	To gain knowledge on various Separation and Detection Techniques
CO4	To apply the chromatographic techniques for the purpose of forensic sample analysis
CO5	To evaluate forensic sample detection through spectroscopic techniques

Paper Name: Evidence and It's Pattern Paper Code: MSFS-103

СО	Description: After the completion of the course student will be able
CO1	To understand the different methods of collection of fingerprint from scene of occurrence for identification
CO2	To know the importance of face, iris & retinal imaging and speech recognition for identification of individual question persons based on comparison

CO3	To gain knowledge on the scope of forensic document examination, classification of important and valuable documents
CO4	To identify the tools used in crime based on the comparison of tool marks obtained from scene of occurrence with the questioned tools and determination of type of tools used in crime
CO5	To identify glass pieces and establish the linkage of suspect with the crime based on comparison of different physical properties of glass pieces and determination of the cause of glass fractured and reconstruction of the scene of occurrence.
CO6	To know the method of identification of person and belongings or articles by comparison of composition of soils using physical and chemical analysis
C07	To understand the importance of exchange of fibres as a physical evidence for establishing the linkage of suspect person with the crime

Paper Name: Crime Scene Management and Quality Assurance Paper Code: MSFS-104

со	Description: After the completion of the course student will be able
CO1	To relate to the protocols of crime scene management

CO2	To recall the general guidelines of evidence from various types crime scenes
CO3	To interpret the medico-legal aspects of injuries sustained from firearms
CO4	To recall the principles of preservation and packaging of exhibits at a crime scene.
CO5	To appraise the importance of quality assurance and accreditation of forensic laboratories
CO6	To apply the different tools and techniques of quality assurance

Paper Name: Essentials of Statistics and Mathematics in Forensic Science Paper Code: MSFS -105

со	Description: After the completion of the course student will be able
CO1	To learn different data types and their proper uses along with data handling, data representation, descriptive measures and exploratory analysis
CO2	To analyze using measures of central tendency, dispersion and location for interpretation of statistical data

CO3	To understand several kinds of mathematical and trigonometric functions and their applications in forensic science
CO4	To understand basic probability theory and graph theory related algorithms to solve forensic problems such as Uniqueness of fingerprints, Bloodstain formation, determine time since death etc.
CO5	To determine various optimum tests for examining a hypothesis regarding a population parameter and apply them for evaluation and transfer of evidence

Paper Name: Pattern Evidence at Crime Scene and Photography Paper Code: MSFS-191

со	Description: After the completion of the course student will be able
CO1	To understand the recording of evidence and collection of clues in hit-and-run cases by forensic photography and Sketching.
CO2	To understand the recording of evidence and collection of clues in hit-and-run cases by forensic photography and Sketching.
CO3	To know how to Record various shreds of evidence involved in cases of sexual offenses, homicide, and property offenses cases.
CO4	To know how to analyze the skid marks and tire tread impressions using various methods.

CO5	To know the importance and use of photography in the analysis of blood spatter evidence at a crime scene.
CO6	To know how to apply the skills of photography in reporting a crime scene involving the use of firearms.
C07	To know how to use photography involving different forms of light e.g. oblique light, transmitted light and side light to examine indented writing and documents.

Paper Name: Field Tests Paper Code: MSFS-192

СО	Description: After the completion of the course student will be able
CO1	To gain hands-on techniques on field test for various forensic sample analysis
CO2	To identify narcotic drugs, blood stain evidence, seminal stains etc.
CO3	To Develop latent fingerprints and related techniques for its preservation and analysis

CO4	To detect explosive materials, broken glass evidence etc. through laboratory methods
CO4	To detect explosive materials, broken glass evidence etc. through laboratory methods

Paper Name: Tools and Techniques Paper Code: MSFS-193

СО	Description: After the completion of the course student will be able
CO1	To know how to make solutions of different molarity, molality or formality and standard buffer solutions
CO2	To know how to determine the density of alcohol using a pycnometer.
CO3	To know how to use a pH meter and how the same is used to determine the pH of any solution.
CO4	To know about microscopy and different microscope and the same can be used to differentiate hair samples.
CO5	To know how to compare soil samples using a microscopic and density-gradient distribution of particles method.
CO6	To know how to make use of microscopy and different electromagnetic radiation e.g. UV, IR etc. to examine documents.

C07	To understand the use of thin-layer chromatography to separate the dyes and inks, plant pigments, body fluids, explosives etc.
CO8	To know how to care, handle, preserve, mark, pack and forward documents

Paper Name: Forensic Chemistry and Toxicology Paper Code: MSFS- 201

со	Description: After the completion of the course student will be able
CO1	To gain knowledge about the various aspects of forensic chemistry.
CO2	To know how to collect shreds of evidence from trap cases and analyze the same.
CO3	To understand the classification of different types of poisons and their modes of action inside a living body.
CO4	To know the procedure of the forensic identification of illicit liquors.
CO5	To understand the identification procedure of petroleum adulterants.

CO6	To apprehend the knowledge of the classification and characteristics of narcotics, drugs and psychotropic substances.
CO7	To understand the methods of identifying and purifying narcotics, drugs and psychotropic substances.

Paper Name: Forensic Biology and Forensic Medicine Paper Code: MSFS- 202

со	Description: After the completion of the course student will be able
CO1	To interpret the various tests of different biological fluids
CO2	To appraise the role of diatoms, pollen grains and microorganisms in forensic science as evidence
CO3	To understand the fundamentals of human skeletal system and dentition
CO4	To recall the fundamentals of hair structure
CO5	To appraise the forensic significance of hair and its role of investigation

CO6	To relate to the concepts of thanatology
C07	To interpret the medico-legal aspects of injuries

Paper Name: Forensic Questioned Documents Paper Code: MSFS- 203

со	Description: After the completion of the course student will be able
CO1	To classify the category of questioned documents, principle and standards for the comparison.
CO2	To interpret the examination of different types of writings, understanding the methods of disguise.
CO3	To appraise the fundamentals of crime scene photography, detection of manipulated digital photography.
CO4	To foster the scope of photography in various disciplines of forensic sciences and their admissibility in the court of law.

Paper Name: Forensic Ballistics and Forensic Physics Paper Code: MSFS- 204

со	Description: After the completion of the course student will be able
CO1	To understand the classification and identification of firearms, including the firing mechanisms of the various types of firearms usually encountered in crime in our country
CO2	To examine and compare bullets and cartridge cases for establishing the linkage of a firearm with respect to fired cartridge cases and bullets
CO3	To analyze gunshot residue particles for shooter identification and estimation of range of fire
CO4	To estimate the range, direction of fire, and type of firearms used for causing injuries
CO5	To determine the cause of the accident from the skid marks and damage caused in road accidents
CO6	To understand the role of nanotechnology in forensic science
C07	To analysis and identify the forensic samples like GSR particles using advanced microscopic techniques such as scanning electron microscopy, etc

CO8	To understand the principles of atomic spectroscopy and its application in the elemental analysis of forensic samples
CO9	To gain knowledge on identification of chemical compounds and forensic samples by FTIR and X-ray spectroscopy
CO10	To know the various photographic and image analysis methods and their use in crime investigation

Paper Name: Cyber Crime Paper Code: MSFS- 205

со	Description: After the completion of the course student will be able
CO1	To relate to various types of cyber crimes
CO2	To recall the fundamentals of computer hardware and networking
CO3	To understand the basics of information security
CO4	To memorize the concepts of cryptography

CO5	To relate to the basic of steganography and steganalysis
CO6	To appraise the protocols of crime scene management in cases of digital crime scene

Paper Name: Forensic Toxicology, Chemistry, Biology and Forensic Medicine Paper Code: MSFS- 291

со	Description: After the completion of the course student will be able
CO1	To learn the laboratory techniques for identification of blood stains, seminal stain, salvia stain, urine stain etc.
CO2	To identify some commonly encountered inorganic poisons such as Arsenic, Antimony, Bismuth, Mercury by color test and microscopic examination.
CO3	To carry out TLC and UV-vis spectrometric analysis of few samples
CO4	To detect explosive materials through laboratory methods.
CO5	To examine microscopically human hair, animal hair, and vegetable fibers

Paper Name: Ballistics and Photography Paper Code: MSFS- 292

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со	Description: After the completion of the course student will be able
CO1	To know the identification of measure and minor constituents of heterogeneous material evidence.
CO2	To know the development of photos from negatives and the importance of film photography in crime scene investigation.
CO3	To understand the constructional features of shotgun ammunition and rifle ammunition in detail.
CO4	To gain knowledge about the examination of comparison of class and individual characteristics of fired bullets.
CO5	To understand the procedure of examination and comparison of fired cartridge cases (caliber, firing pin marks, breech face marks, chamber marks, extractor and ejector marks)
CO6	To understand the importance of Walker's Test and barrel wash for the detection of nitrites in the partially burnt and unburnt propellants

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Paper Name: Documents Examination Paper Code: MSFS- 293

со	Description: After the completion of the course student will be able
CO1	To preliminary examination of questioned documents using analytical techniques
CO2	To encrypt and decrypt the partition using bitlocker
CO3	To collect and preserve volatile data
CO4	To restore the deleted files and folders

Paper Name: Firearms, Ammunitions & Instrumentation Techniques Paper Code: MSFS- 301A

со	Description: After the completion of the course student will be able
CO1	To appraise knowledge of the classification, characteristics, and various components of small arms such as handguns, rifles with

	smooth bores, and shotguns commonly used in crime, as well as their functions for forensic purposes
CO2	To interpret manufacturing information and marks are imprinted on firearms for identification
CO3	To recall the knowledge of the classification and constructional features of cartridges and their components
CO4	To understand propellants (gun powder, smokeless powder, etc.) and their composition and structure
CO5	To relate the knowledge of the constructional features and composition of bullets commonly used in crime
CO6	To apply the instrumentation techniques used for elemental analysis of firearm exhibits and estimation of range of fire.

Paper Name: Questioned Documents and Handwriting Analysis Paper Code: MSFS- 301B

со	Description: After the completion of the course student will be able
CO1	To recognize the concept of signature examination & principles of handwriting identification, general characteristics and their estimations. & procurement of handwriting standards.

CO2	To interpret the detection and decipherment of various alterations, mechanical impressions & fixing authorship of forged writings and signatures.
CO3	To examine anonymous letters, assess various components of individual characteristics and how it helps to detect the authorship & prove the authenticity.
CO4	To determine relative age of writing and signatures & decipherment of charred documents, Reconstruction of torn documents.
CO5	To relate to the concepts & methods of examining Questioned documents, using various instrumentation & photography.

Paper Name: Advanced Digital Forensics Paper Code: MSFS- 301C

со	Description: After the completion of the course student will be able
CO1	To understand the basics of the investigation process involved in digital evidence analysis
CO2	To interpret the analytical aspects involved in different OS systems

CO3	To appraise the application of forensic techniques involved in analysis of digital evidence
CO4	To understand the fundamentals of virtual environment
CO5	To relate the analytical techniques involved in acquisition of digital evidence in different OS systems
CO6	To recall the rules and regulations involved in analysis of digital evidence.

Paper Name: Identification of Firearms, Range of Firing & Chemical Tests Paper Code: MSFS- 302A

со	Description: After the completion of the course student will be able
CO1	To gain knowledge on the identification of firearm ammunition based on various types of marks such as breech-face marks, chamber marks, extractor marks, ejector marks, etc.
CO2	To recall chemical tests for identifying targets with bullet holes

CO3	To apply the knowledge on the examination and comparison of test and crime bullets using a comparison microscope and photomicrography for records.
CO4	To determine the firing range of a firearm by the dispersion pattern of GSR and GSR particles, shot pattern, etc.
CO5	To recall the chemical tests of fired discharge residues on commonly clothed targets in order to determine range of fire
CO6	To estimate the time of fire of fired cartridges and bullets.
CO7	To interpret ballistic databases of fired bullet and cartridge case characteristics marks and comparison for firearm linkage with respect to fired cartridge cases via an online, integrated, automated ballistics system

Paper Name: Mechanical Impressions Paper Code: MSFS- 302B

со	Description: After the completion of the course student will be able
CO1	To appraise the working of standard mechanical and electrical typewriters and examination typescripts, using non-destructive methods of analysis.

CO2	To interpret examination and identification of digitally manipulated documents using computers and printers & methods of identification of toners and inks used in printing.
CO3	To Recall the definition and concepts principle and working of different conventional printing technologies.
CO4	To understand the examination of black and white and color photocopies, also compare differences between Photocopies, Computer Printouts and Scanned copies.

Paper Name: Networks Security Forensics Paper Code: MSFS- 302C

со	Description: After the completion of the course student will be able
CO1	To understand the overview of network and communication technologies
CO2	To recognise the various types of network threats and attacking mechanisms.

CO3	To interpret the different aspects involved in network security
CO4	To relate to the analytical aspects involved in network forensics
CO5	To recall the applicability of different tools and techniques involved in network security forensics

Paper Name: Wound Ballistics, Reconstruction & Report Writing Paper Code: MSFS- 303A

СО	Description: After the completion of the course student will be able
CO1	To relate to the various aspects of gunshot wounds for estimation of range and direction of firing and the wounding capabilities of projectiles
CO2	To comprehend the use of firearms based on the nature of firearms injuries
CO3	To study wound ballistic experiments in laboratory conditions to understand the wounding capabilities of bullets fired in test firings on non-living targets in the laboratory

CO4	To understand wound ballistic parameters such as temporary cavities and permanent cavities on wound ballistic targets for simulation of the actual wounding effect in living targets
CO5	To gain the ability to reconstruct the sequence of events in shooting incidents under various conditions.
CO6	To apply the knowledge of report and worksheet writing with respect to a visit to a crime scene involving firearms
C07	To know various court rulings relevant to forensic ballistics.

Paper Name: Bank Frauds and Forensic Accounting Paper Code: MSFS- 303B

со	Description: After the completion of the course student will be able
CO1	To understand the basics of accounting, & types of banks, banking instruments and types of alteration.
CO2	To appraise the corporate investigative techniques, understanding the difference between auditing & investigation.
CO3	To employ the knowledge of Investigation of asset misappropriation schemes.

CO4	To recognize various theories of Investigation procedures, opinion, drafting reports and prepare it for testimony.

Paper Name: Mobile & Wireless Device Forensics Paper Code: MSFS- 303C

со	Description: After the completion of the course student will be able
CO1	To understand various aspects of mobile and wireless technologies
CO2	To relate the vulnerabilities and threats associated with mobile and wireless devices
CO3	To acquire understanding of the fundamentals of the investigation process in relation to mobile and wireless devices
CO4	To interpret the analytical techniques involved in evidence analysis of Android and iOS devices
CO5	To relate the different forensic practices involved in investigation of mobile and wireless devices

Paper Name: Internal, External Ballistics & Gun-shot Residue Paper Code: MSFS- 304A

СО	Description: After the completion of the course student will be able
CO1	To differentiate between internal, external, and terminal ballistics and their applications in the identification of firearms and reconstruction of shooting incidents.
CO2	To relate to the knowledge of thermochemistry of single-base and double-base propellants to understand the interior ballistics and the performance of firearms and its specific ammunition.
CO3	To interpret the effect of air resistance on the base drag, drop, drift, and shape of the projectile and their stability on external ballistics
CO4	To recall the knowledge about the shape of the projectile, form factor, ballistic coefficient, etc., to help you evaluate the trajectory parameters and problems of forensic significance
CO5	To calculate projectile trajectories using ballistic tables for the reconstruction of shooting incidents beyond shot ranges
CO6	Understanding the mechanism of gunshot residue formation will help you better understand international ballistics phenomena, as well as ammunition information for shooter identification and other forensic issues, especially in close range firing incidents.
C07	To apply the knowledge about GSR analysis by various instrumentation techniques such as AAS, NAA, SEM/EDXA, ICP-MS, etc.

Paper Name: Digital & Security Documents Paper Code: MSFS- 304B

со	Description: After the completion of the course student will be able
CO1	To illustrate the detection of various forged travel documents and their security features, modus operandi of counterfeiting of banknotes and their and their detection.
CO2	To interpret the examination of the security features of plastic cards.
CO3	To employ the basics of Computer forensics investigation pre- search consideration, acquisition, collection and preservation of data. Evidence Recovery & Analysis of Digital Evidence.
CO4	To appraise quality & safety management regulations in document laboratories, various formats used for recording, chain of custody and report writings.

Paper Name: Cyber Laws & Intellectual Property Rights Paper Code: MSFS- 304C

со	Description: After the completion of the course student will
	be able

CO1	To understand the various crimes associated with cyber space
CO2	To relate the basics of legal recognition of various electronic documents and its associated regulations.
CO3	To understand the legal provisions of Information Technology Act (2008) and Intellectual Property Rights
CO4	To relate the issues in cyber space with the penal provisions in Information Technology Act (2008) and Intellectual Property Rights

Paper Name: Applications of Instrumentation Techniques in Forensic Ballistics Paper Code: MSFS- 391A

СО	Description: After the completion of the course student will be able
CO1	To recognize small arms, and how to record their data, lock mechanism and trigger pull.
CO2	To determine the shot size from diameter and weight of shots/pellets.
CO3	To photograph and sketch crime scenes involving firearms.

CO4	To collect, preserve and do the packing of exhibits that has been received for examination.
CO5	To determine the suspected firearms used during committing the crime by firing the bullet.
CO6	To relate the concept and utility of packaging, sealing and labeling of exhibits.

Paper Name: Handwriting and Mechanical Impressions Paper Code: MSFS- 391B

СО	Description: After the completion of the course student will be able
CO1	To apply the knowledge of handwriting features and instrumental impact in questioned document examination
CO2	To interpret the concepts of forensic stylistics for individualisation
CO3	To relate to the features of forgery for detection
CO4	To apply the methodologies for examining charred documents, torn documents and various mechanical impressions

Paper Name: Advance Digital Forensics Paper Code: MSFS- 391C

со	Description: After the completion of the course student will be able
CO1	To relate to the knowledge of collection method of digital evidence collection
CO2	To apply analytical tools and techniques and interpret the acquired evidence
CO3	To interpret the various evidentiary items available in digital devices
CO4	To analyze the available digital evidence and decide the best suited method of examination

Paper Name: Documentation of Crime Scene involving Firearm, handling or Evidentiary Clues Paper Code: MSFS- 392A

со	Description: After the completion of the course student will
	be able

CO1	To understand the basics of TLC techniques and how this technique is used in differentiating propellants used different firearms.
CO2	To gain knowledge about the AAS techniques and the same can be applied by then in gun shoot residues.
CO3	To understand the origin of IR and different mode involved in IR and its utilization in identifying propellants loaded in different firearms
CO4	To understand the basics of HPLC and how the technique is used in the analysis of propellant
CO5	To understand the GC technique and its use in ballistics
CO6	To know how to make gelatin gel blocks.

Paper Name: Examination of Electronically Printed Documents & Counterfeits Paper Code: MSFS- 392B

СО	Description: After the completion of the course student will be able

CO1	To apply analytical techniques for examination different types of documents such as travel documents, stamp papers, currency notes etc.
CO2	To apply the knowledge of aging of documents to establish relative age of questioned documents
CO3	To interpret various features of photocopied, scanned, printed and faxed documents.
CO4	To detect the authenticity of plastic cards

Paper Name: Network Security and Forensics Paper Code: MSFS- 392C

со	Description: After the completion of the course student will be able
CO1	To relate the knowledge of different network vulnerabilities with the relevant analytical techniques
CO2	To apply the fundamental methodologies involved in exploitation of various network vulnerabilities
CO3	To recall the various methods of evidence collection from network

CO4	To implement different tools and techniques for analyzing network evidence

Paper Name: Forensic Ballistics- Identification of firearms, Range of firing, Chemical Tests Paper Code: MSFS- 393A

со	Description: After the completion of the course student will be able
CO1	To know how to restore the serial number on a firearm
CO2	To gain knowledge about the chemical test that is used for the detection of the presence of nitride in Gun shoot residues.
CO3	To understand the differentiation between jacketed and non- jacketed projectiles.
CO4	To know the basics of microscopy specifically comparison microscope and its use to compare cartridges
CO5	To calculate the range of firing from the given evidence pattern.
CO6	To understand the reconstruction methods of the events of a shooting incident.

CO7	To determine the distance and direction of the firing from a given deceased body.

Paper Name: Analysis of Digital Documents and Bank Instruments Paper Code: MSFS- 393B

со	Description: After the completion of the course student will be able
CO1	To relate to the methodologies applied in investigation process of digital documents
CO2	To interpret the analytical tools and techniques involved in digital evidence examination
CO3	To apply the knowledge of bank systems and instruments along with different stamp papers
CO4	To apply the knowledge of report drafting after examination of digital documents

Paper Name: Mobile and Wireless Device Forensics Paper Code: MSFS- 393C

со	Description: After the completion of the course student will be able
CO1	To apply the concept of mobile forensic in investigation process
CO2	To interpret the relevant analytical tools and techniques to acquire data from various mobile and wireless devices
CO3	To analyze and interpret different digital evidence present in various mobile and wireless devices.
CO4	To relate to the knowledge of various methodologies of handling mobile forensic evidence

Paper Name: Research Methodology and Communication Skills Paper Code: MSFS- 401

со	Description: After the completion of the course student will be able
CO1	To understand the basic concept of Scientific Research and its methodology
CO2	To apply scientific research problems for social/scientific developments

CO3	To acquire research model followed by successive experimental design
CO4	To evaluate scientific research problems through expertise
CO5	To develop the basic communication & presentation skills for writing scientific report

Program Name: M.Tech in Computer Science and Engineering

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MTECHCSE/AllSem.pdf

Paper Name: Mathematical foundations of Computer Science Paper Code: PGCS101

СО	Description: After the completion of the course student will be able
CO1	To understand the basic notions of discrete and continuous probability.
CO2	To understand the methods of statistical inference, and the role that sampling distributions play in those methods.
CO3	To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.

Paper Name: Advanced Data Structures Paper Code: PGCS102

со	Description: After the completion of the course student will be able
CO1	Understand the implementation of symbol tables using hashing techniques.

CO2	Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
CO3	Develop algorithms for text processing applications.
CO4	Identify suitable data structures and develop algorithms for computational geometry problems.

Paper Name: Research Methodology and IPR Paper Code: PGCS105

со	Description: After the completion of the course student will be able
CO1	Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problems, data collection, analysis, interpretation, Necessary instrumentations.
CO2	Effective literature studies approaches, analysis Plagiarism, Research ethics
CO3	Effective technical writing, how to write reports, Paper. Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

CO4	Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.
CO5	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.
CO6	New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Paper Name: English for Research Paper Writing Paper Code: Audit Course I(A)

со	Description: After the completion of the course student will be able
CO1	Understand that how to improve your writing skills and level of readability
CO2	Learn about what to write in each section

CO3	Understand the skills needed when writing a Title Ensure the good quality of paper at very first time submission

Paper Name: Disaster management Paper Code: Audit Course I(D)

СО	Description: After the completion of the course student will be able
CO1	learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO2	critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives
CO3	develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO4	critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Paper Name: Pedagogy Studies Paper Code: Audit Course I(B)

со	Description: After the completion of the course student will be able
CO1	Oriented towards Basics of pedagogy and familiarized with the educational process.
CO2	Understand and select the best approaches to teaching
CO3	Develop a positive attitude towards life and teaching profession
CO4	Use the collaborative learning into a course in a way that aligns with students learning objectives and intended outcomes
CO5	Critically analyze the classroom teaching learning and the ability to observe classroom behavior.
CO6	Understand process of communication and use them in their classroom teaching and inculcate multiculturalism in their students.

Paper Name: Constitution of India Paper Code: Audit Course I(C)

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СО	Description: After the completion of the course student will be able
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CO1	Describe the historical background of the constitution making and its importance for building a democratic India.
CO2	Explain the functioning of three wings of the government i.e., executive, legislative and judiciary.
CO3	Explain the value of the fundamental rights and duties for becoming a good citizen of India.
CO4	Analyze the decentralization of power between central, state and local self-governments.
CO5	Apply the knowledge in strengthening the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy of India.

Paper Name: Advanced Data Structures Lab Paper Code: PGCS 191

СО	Description: After the completion of the course student will be able
CO1	Implement List ADTs and their operations.
CO2	Develop programs for sorting.

CO3	Develop programs for implementing trees and their traversal operations.
CO4	Implement graph traversal algorithms.
CO5	Apply algorithm design techniques.

Paper Name: Advances in Algorithms Paper Code: PGCS-201

со	Description: After the completion of the course student will be able
CO1	Analyze the complexity/performance of different algorithms.
CO2	Determine the appropriate data structure for solving a particular set of problems.
CO3	Categorize different problems in various classes according to their complexity and know how to approach towards computationally hard problems

Paper Name: Soft Computing Paper Code: PGCS202

со	Description: After the completion of the course student will be able
CO1	Identify Soft Computing Techniques to handle real world decision and optimization problems.
CO2	Apply soft computing to handle uncertainty, imprecision and solve various engineering problems.
CO3	Evaluate and compare solutions by various soft computing approaches for a given problem.

Paper Name: Value education Paper Code: Audit Course II(E)

СО	Description: After the completion of the course student will be able
CO1	Understand value of education and self- development
CO2	Imbibe good values in students

CO3	Let the should know about the importance of character

Paper Name: Stress management by Yoga Paper Code: Audit Course II(F)

со	Description: After the completion of the course student will be able
CO1	To achieve overall health of body and mind
CO2	To overcome stress

Paper Name: Personality development through life enlightenment skills Paper Code: Audit Course II(G)

со	Description: After the completion of the course student will be able
CO1	To learn to achieve the highest goal happily
CO2	To become a person with stable mind, pleasing personality and determination

CO3	To awaken wisdom in students

Paper Name: Sanskrit for Technical Knowledge Paper Code: Audit Course II(H)

СО	Description: After the completion of the course student will be able
CO1	To get a working knowledge in illustrious Sanskrit, the scientific language in the world
CO2	Learning of Sanskrit to improve brain functioning
CO3	Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
CO4	The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Paper Name: Advances in Algorithm Paper Code: PGCS-292

со	Description: After the completion of the course student will be able
CO1	Ability to use databases for building web applications.
CO2	Gaining knowledge about the internals of a database system.

Program Name: M.Tech in Artificial Intelligence

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Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MTECHITAI/AllSem.pdf

Paper Name: Program Core I- Mathematical foundations of Computer Science Paper Code: PGIT(AI)101

СО	Description: After the completion of the course student will be able
CO1	Know how to represent various statements using quantifiers, relations, functions, permutations and combinations, groups, graphs and trees
CO2	Analyze the growth of functions and real world problems using various concepts like recurrence relations, graph coloring, etc
CO3	To study various sampling and classification problems
CO4	Apply mathematical logic to solve problems, pigeonhole principle to solve real time problems
CO5	Able to use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, and functions
CO6	Able to formulate problems and solve recurrence relations.

Paper Name: Program Core II- Advances in Artificial Intelligence Paper Code: PGIT(AI)102

со	Description: After the completion of the course student will be able
CO1	Understand the many sorts of problems and use search tactics to solve them.
CO2	Represent tough real-world issues in a state space representation in order to solve them using AI approaches such as searching and game playing.
CO3	Create and test intelligent expert models for perception and prediction from intelligent environments.
CO4	Using decision-making strategies, develop viable solutions to issues with uncertain inputs or outcomes.
CO5	Demonstrate and improve expertise to choose and apply AI technologies to synthesize information and construct models within the restrictions of the application domain.
CO6	Investigate the challenges associated in knowledge bases, reasoning systems, and application area planning limits.

Paper Name: Research Methodology and IPR Paper Code: PGIT(AI)105

со	Description: After the completion of the course student will be able
CO1	Understand research problem formulation.
CO2	Analyze research related information
CO3	Follow research ethics
CO4	Understand that today's world is controlled by Computer, Information Technology, but tomorrow's world will be ruled by ideas, concepts, and creativity.
CO5	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular
CO6	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits

Paper Name: English for Research Paper Writing Paper Code: PGIT(AI)106A

со	Description: After the completion of the course student will be able
CO1	Recognize, explain, and apply the formal features of certain organizational communication genres such as recommendations, analytical reports, proposals, memorandums, web pages, and promotional papers.
CO2	Learn how to enhance your writing abilities and readability level.
CO3	Understand how to critically examine research material, incorporate it into assigned writing effectively, simply, and logically, and properly cite the source.
CO4	Describe how to create a title, abstract, and introduction.
CO5	Use proper referencing style and punctuation as necessary.
CO6	Understand how to critically examine research material, incorporate it into assigned writing effectively, simply, and logically, and properly cite the source.

Paper Name: Disaster Management Paper Code: PGIT(AI)106B

со	Description: After the completion of the course student will be able
CO1	Explain the disaster management components; i.e. cycle, phases, risk, crisis, emergency, disasters, and resilience
CO2	Compare hazards, disasters and associated natural phenomena and their interrelationships
CO3	understand Medical and Psycho-Social Response to Disasters
CO4	Apply knowledge about existing global frameworks and existing agreements and role of community in successful Disaster Risk Reduction
CO5	Evaluate DM study including data search, analysis and presentation as a case study.
CO6	Create Technological innovations in Disaster Risk Reduction: Advantages and problems

Paper Name: Sanskrit for Technical Knowledge Paper Code: PGIT(AI)106C
CO1	To get a working knowledge in illustrious Sanskrit, the scientific language in the world
CO2	Learning of Sanskrit to improve brain functioning
CO3	Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
CO4	The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Paper Name: Value Education Paper Code: PGIT(AI)106D

со	Description: After the completion of the course student will be able
CO1	understand the importance of value based living.
CO2	gain a deeper understanding about the purpose of their life.
CO3	understand and start applying the essential steps to become good leaders.

CO4	merge as responsible citizens with clear conviction to practice values and ethics in life.
CO5	develop value based professionals.
CO6	contribute in building a healthy nation.

Paper Name: Laboratory 1(Artificial Intelligence Lab) Paper Code: PGIT(AI)192

со	Description: After the completion of the course student will be able
CO1	Explain artificial intelligence, its characteristics and its application areas. (C1-Knowledge)
CO2	Formulate real-world problems as state space problems, optimization problems or constraint satisfaction problems. (C4-Analysis)
CO3	Select and apply appropriate algorithms and AI techniques to solve complex problems. (C3-Application)
CO4	Design and develop an expert system by using appropriate tools and techniques. (C3-Application)

Paper Name: Program Core III – Advanced Algorithms Paper Code: PGIT(Al)201

со	Description: After the completion of the course student will be able
CO1	design and analyze programming problem statements.
CO2	Select relevant data structures and algorithms, comprehend the ADT/libraries, and apply it to the construction of algorithms for a given issue.
CO3	comprehend the mathematical abstraction required to solve issues
CO4	generate efficiency analyses and demonstrations of accuracy
CO5	grasp and choose problem-specific algorithm design techniques

Paper Name: Program Core IV – Artificial Neural Networks Paper Code: PGIT(AI)202

со	Description: After the completion of the course student will be able
CO1	Recognize the distinction between a biological neuron and an artificial neuron.
CO2	Learn about the various applications of neural networks.
CO3	Understand the components of Neural Networks.
CO4	Create neural network models
CO5	Create apps that use neural networks.

Paper Name: Constitution of India Paper Code: PGIT(AI)205A

со	Description: After the completion of the course student will be able
CO1	Identify and explore the basic features and modalities about the Indian constitution.

CO2	Differentiate and relate the functioning of the Indian parliamentary system at the center and state level.
CO3	Differentiate different aspects of the Indian Legal System and its related bodies.
CO4	Discover and apply different laws and regulations related to engineering practices.
CO5	Correlate role of engineers with different organizations and governance models

Paper Name: Pedagogy Studies Paper Code: PGIT(AI)205B

со	Description: After the completion of the course student will be able
CO1	Explain the overall concept of Pedagogy.
CO2	Analyze different components of curriculum and their implementation.
CO3	Explain Outcome Based Education and its implementation.

CO4	Explain the role of Technology in Pedagogy and its implementation.

Paper Name: Stress management by Yoga Paper Code: PGIT(AI)205C

со	Description: After the completion of the course student will be able
CO1	To achieve overall health of body and mind
CO2	To overcome stress

Paper Name: Personality development through life enlightenment skills Paper Code: PGIT(AI)205D

со	Description: After the completion of the course student will be able
CO1	To learn to achieve the highest goal happily
CO2	To become a person with stable mind, pleasing personality and determination

CO3	To awaken wisdom in students

Paper Name: Laboratory 3 (Based on Artificial Neural Network) Paper Code: PGIT(AI)292

CO	Description: After the completion of the course student will be able
CO1	superior for cognitive tasks and processing of sensorial data such as vision, image- and speech recognition, control, robotics, expert systems
CO2	design single and multi-layer feed-forward neural networks
CO3	understand supervised and unsupervised learning concepts & understand unsupervised learning using Kohonen networks
CO4	understand training of recurrent Hopfield networks and associative memory concepts.

Program Name: M.Tech in Information Security

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Syllabus Link: http://makautexam.net/aicte_details/CourseStructurel/MTECHITIS.pdf

Paper Name: Program Core IMathematical foundations of Computer Science Paper Code: PGIT(IS)101

со	Description: After the completion of the course student will be able
CO1	Know how to represent various statements using quantifiers, relations, functions, permutations and combinations, groups, graphs and trees
CO2	Analyze the growth of functions and real world problems using various concepts like recurrence relations, graph coloring, etc
CO3	To study various sampling and classification problems
CO4	Apply mathematical logic to solve problems, pigeonhole principle to solve real time problems
CO5	Apply mathematical logic to solve problems, pigeonhole principle to solve real time problems
CO6	Able to model and solve real-world problems using graphs and trees.

Paper Name: Program Core IIAdvanced Data Structures Paper Code: PGIT(IS)102

со	Description: After the completion of the course student will be able
CO1	Summarize the concept of data structure, data type and array data structure
CO2	Implement linked list data structure to solve various problems.
CO3	Apply various data structures such as stacks, queues, trees and graphs to solve various computing problems using C-programming language.
CO4	Compare the standard algorithms for searching and sorting
CO5	Evaluate the performance of an algorithm in terms of complexity using asymptotic notation.
CO6	Choose effectively the data structure that efficiently model the information in a problem

Paper Name: Research Methodology and IPR Paper Code: PGIT(IS)105

со	Description: After the completion of the course student will be able
CO1	Understand research problem formulation.
CO2	Analyze research related information
CO3	Follow research ethics
CO4	Understand that today's world is controlled by Computer, Information Technology, but tomorrow's world will be ruled by ideas, concepts, and creativity.
CO5	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular
CO6	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits

Paper Name: Laboratory 1 (Advanced Data Structures) Paper Code: PGIT(IS)192

со	Description: After the completion of the course student will be able
CO1	Represent data for efficient processing using the fundamental concept of Data Structure.
CO2	Develop applications using the search algorithms and sorting algorithms based on their time complexities.
CO3	Develop applications using the concepts of linear data structure like stack, queue and Linked List for different requirements.
CO4	Implement non-linear data structures like trees and graphs.
CO5	Design the application using the data structure that efficiently model the information in a problem

Paper Name: Audit Course Paper Code: PGIT(IS)106A/B/C/D

со	Description: After the completion of the course student will be able
CO1	Recognize what audit questions call for an impact audit with the objective of determining the outcome results attributable to a program or initiative

CO2	Explain how impact audits with a focus on outcome results are similar to and different from traditional performance audits
CO3	Describe the basic methodology for conducting impact audits
CO4	Define and apply the finding elements for impact audits
CO5	Identify rival causes that can adversely affect an auditor's ability to draw sound conclusions about the results attributable to a program or initiative
CO6	Prepare a Cost and Benefit Analysis of an implemented program or initiative

Paper Name: Program Core III – Advanced Algorithms Paper Code: PGIT(IS)2 01

со	Description: After the completion of the course student will be able
CO1	design and analyze programming problem statements.
CO2	choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.

CO3	understand the necessary mathematical abstraction to solve problems.
CO4	come up with analysis of efficiency and proofs of correctness
CO5	comprehend and select algorithm design approaches in a problem specific manner.

Paper Name: Program Core IV – Soft Computing Paper Code: PGIT(IS)2 02

со	Description: After the completion of the course student will be able
CO1	Learn about soft computing techniques and their applications
CO2	Analyze various neural network architectures
CO3	Understand perceptrons and counter propagation networks.
CO4	Define the fuzzy systems

CO5	Analyze the genetic algorithms and their applications.
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Paper Name: Constitution of India Paper Code: PGIT(IS)205A

СО	Description: After the completion of the course student will be able
CO1	Describe the historical background of the constitution making and its importance for building a democratic India.
CO2	Explain the functioning of three wings of the government i.e., executive, legislative and judiciary.
CO3	Explain the value of the fundamental rights and duties for becoming a good citizen of India.
CO4	Analyze the decentralization of power between central, state and local self-governments.
CO5	Apply the knowledge in strengthening the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy of India.

Paper Name: Pedagogy Studies Paper Code: PGIT(IS)205B

со	Description: After the completion of the course student will be able
CO1	Oriented towards Basics of pedagogy and familiarized with the educational process.
CO2	Understand and select the best approaches to teaching
CO3	Develop a positive attitude towards life and teaching profession
CO4	Use the collaborative learning into a course in a way that aligns with students learning objectives and intended outcomes
CO5	Critically analyze the classroom teaching learning and the ability to observe classroom behavior.
CO6	Understand the process of communication and use them in their classroom teaching and inculcate multiculturalism in their students.

Paper Name: Stress management by Yoga Paper Code: PGIT(IS)205C

CO	Description: After the completion of the course student will be able
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CO1	Develop healthy mind in a healthy body thus improving social health also
CO2	Improve efficiency

Paper Name: Personality development through life enlightenment skills Paper Code: PGIT(IS)205D

со	Description: After the completion of the course student will be able
CO1	To learn to achieve the highest goal happily
CO2	To become a person with stable mind, pleasing personality and determination
CO3	To awaken wisdom in students

Paper Name: Advanced Algorithms Lab Paper Code: PGIT(IS)291

СО	Description: After the completion of the course student will be able

CO1	Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class.
CO2	Master different algorithm design techniques (brute-force, divide and conquer, greedy, etc
CO3	Ability to apply and implement learned algorithm design techniques and data structures to solve problems.

Paper Name: Soft Computing Lab Paper Code: PGIT(IS)292

со	Description: After the completion of the course student will be able
CO1	Explore methods that implement neural network techniques.
CO2	Practice the fuzzy set relations using different operations.
CO3	Design Regression techniques for a set of data points.
CO4	Capture an appropriate classification model for analytical tasks.

CO5	Implement best practices and techniques for computing efficiently.
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Program Name: M.Tech in Embedded Systems & VLSI Design

Syllabus Link: http://makautexam.net/aicte_details/SyllabusI/MTECHEVLSI/AllSem21.pdf

Paper Name: Digital VLSI Design Paper Code: PGVES - 101

со	Description: After the completion of the course student will be able
CO1	Learn the basics of Integrated Circuit (IC),; different Domains of VLSI design, design automation tools and the state-of-the-art VLSI circuits.
CO2	Learn CMOS logic behavior, advantages and drawbacks using static, dynamic, Domino logic and Bi-CMOS logic
CO3	Learn the basics of CMOS fabrication and Layout.
CO4	Learn EDA tools and their advantages, concept of test bench, simulation, design verification, synthesis and hardware description language (Verilog/VHDL/System 'C')
CO5	learn the concept of Programmable Hardware and their requirements, FPGAarchitecture, configuration and design flow, concept of System on Chip (SOC).
CO6	Learn logical effort, path effort, path effort delay, path parasitic delay, designing fast circuits and multistage logic networks and the concept of delay vs fan out

Learn the design of a 32-bit RISC CPU, Static RAM and Simulation,
Synthesis & Validation of the architectures on FPGA and analyze
their performances.

Paper Name: Microcontrollers and Programmable Digital Signal Processors Paper Code: PGVES - 102

СО	Description: After the completion of the course student will be able
CO1	the Concept of Processor Architecture, Data path Design and Control Unit (hardwired control unit, microprogrammed and nano programmed Control unit).
CO2	the Architecture and Programming model of ARM Cortex-M3 Processor/LPC I7xx Microcontroller, the concept of Interrupt with emphasize to interrupt vector, nested interrupt, interrupt chaining, interrupt latency, interrupt controller and efficient handling of interrupts.
CO3	the concept of RISC & CISC Processors, Harvard Architecture and VLIW Architecture.
CO4	to identify and characterize architectural and programming requirements of DSP Processors and to learn the architectural details of Texas Instrument TMS320C67xx series DSP Processors.

005	to acquire skills on handling DSP software development platform
005	for application development with a case study on code composer
	studio.

Paper Name: Research Methodology and IPR Paper Code: PGVES-105

со	Description: After the completion of the course student will be able
CO1	Understand research problem formulation.
CO2	Analyze research related information
CO3	Follow research ethics
CO4	Understand that today's world is controlled by Computer, Information Technology, but tomorrow's world will be ruled by ideas, concepts, and creativity.
CO5	Understanding that when IPR would take such an important place in the growth of individuals & nations, it is needless to emphasize the need for information about Intellectual Property Rights to be promoted among students in general & engineering in particular.

Paper Name: English for Research Paper Writing

Paper Code: PGVES-106

со	Description: After the completion of the course student will be able
CO1	Understand that how to improve your writing skills and level of readability
CO2	Learn about what to write in each section
CO3	Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

Paper Name: Disaster Management Paper Code: PGVES-106

СО	Description: After the completion of the course student will be able
CO1	learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO2	critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

CO3	develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
CO4	critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Paper Name: Sanskrit for Technical Knowledge Paper Code: PGVES-106

со	Description: After the completion of the course student will be able
CO1	To get a working knowledge in illustrious Sanskrit, the scientific language in the world
CO2	. Learning of Sanskrit to improve brain functioning
CO3	Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
CO4	The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Paper Name: Value Education Paper Code: PGVES-106

со	Description: After the completion of the course student will be able
CO1	Understand value of education and self-development
CO2	Imbibe good values in students
CO3	Let the should know about the importance of character

Paper Name: Constitution of India Paper Code: PGVES-106

СО	Description: After the completion of the course student will be able
CO1	Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
CO2	To address the growth of Indian opm10n regarding modern Indian intellectuals ' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

CO3	To address the role of socialism In India after the commencement
	of the Bolshevik Revolution in 1917 and its impact on the initial
	drafting of the Indian Constitution.

Paper Name: Pedagogy Studies Paper Code: PGVES-106

со	Description: After the completion of the course student will be able
CO1	Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
CO2	Identify critical evidence gaps to guide the development.

Paper Name: Stress Management by Yoga Paper Code: PGVES-106

СО	Description: After the completion of the course student will be able
CO1	To achieve overall health of body and mind

CO2	To overcome stress

Paper Name: Personality Development through Life Enlightenment Skills Paper Code: PGVES-106

со	Description: After the completion of the course student will be able
CO1	To learn to achieve the highest goal happily
CO2	To become a person with stable mind, pleasing personality and determination
CO3	To awaken wisdom in students

Paper Name: Digital VLSI Design Lab Paper Code: PGVES-191

со	Description: After the completion of the course student will be able
CO1	familiarized with the steps by step process involved in VLSI design and with different EDA tools (open source as well as commercial)

CO2	write programs in hardware description language (HDL) like Verilog, VHDL for digital circuits and learn design verification using a test bench.
CO3	develop skill to design, simulate, synthesize and validate digital circuits on FPGA Platform using design Tools like Xilinx ISE / Icarus Verilog.
CO4	develop skill to design digital circuits using VLSI design Tools like DSCH & Microwind.
CO5	Develop the skill for Layout of digital circuit using EDA tools like Cadence and Electric.

Paper Name: Micro-controller and Programmable Digital Signal Processor Lab Paper Code: PGVES-192

со	Description: After the completion of the course student will be able
CO1	Install, configure and utilize tool sets for developing applications based on ARM processor core SoC and DSP processor.
CO2	Develop prototype codes using commonly available on and off chip peripherals on the Cortex M3 and DSP development boards.

Paper Name: Analog VLSI Design Paper Code: PGVES - 201

СО	Description: After the completion of the course student will be able
CO1	Analyze, design, optimize and simulate analog and digital circuits using CMOS constrained by the design metrics.
CO2	Connect the individual gates to form the building blocks of a system.
CO3	Use EDA tools like Cadence, Mentor Graphics and other open source software tools like Ngspice.

Paper Name: VLSI Design Verification and Testing Paper Code: PGVES - 202

со	Description: After the completion of the course student will be able
CO1	Familiarity with Front end design and verification techniques and creating reusable test environments.
CO2	Verify increasingly complex designs more efficiently and effectively.
CO3	Use EDA tools like Cadence, MentorGraphics.

Paper Name: Analog VLSI Design Lab Paper Code: PGVES - 291

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со	Description: After the completion of the course student will be able
CO1	familiarized with VLSI Tool like cadence virtuoso.
CO2	design analog circuits using a schematic editor window and also be able to test the design.
CO3	extract the Layout of analog circuits and CMOS circuits using Layout-XL.
CO4	Carry on transient, dc and ac analysis of the designed circuit using cadence virtuoso.
CO5	understand the DRC check, LVS and RC Extraction.
CO6	familiarized with LTSpice Tool and design and test circuits.
CO7	familiarized with the concept of FPAA and implement different mathematical functions on the FPAA platform.

Paper Name: VLSI Design Verification and Testing Lab

Paper Code: PGVES - 292

со	Description: After the completion of the course student will be able
CO1	Verify increasingly complex designs more efficiently and effectively.
CO2	Use EDA tools like Cadence, MentorGraphics.

Paper Name: English for Research Paper Writing Paper Code: PGVES-205

со	Description: After the completion of the course student will be able
CO1	Understand that how to improve your writing skills and level of readability
CO2	Learn about what to write in each section
CO3	Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

Paper Name: Disaster Management

со	Description: After the completion of the course student will be able
CO1	learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO2	critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO3	develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Paper Name: Sanskrit for Technical Knowledge Paper Code: PGVES-205

со	Description: After the completion of the course student will be able
CO1	Understanding basic Sanskrit Language

CO2	Ancient Sanskrit literature about science & technology can be understood
CO3	Being a logical language will help to develop logic in students

Paper Name: ValueEducation Paper Code: PGVES-205

со	Description: After the completion of the course student will be able
CO1	Knowledge of self-development
CO2	Learn the importance of Humanvalues
CO3	Developing the overall personality

Paper Name: Constitution of India Paper Code: PGVES-205

СО	Description: After the completion of the course student will be able
CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi Indian politics.
CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution inIndia.
CO3	Discuss the circumstances surrounding the foundation of the Congress SocialistParty [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in Indian Constitution
CO4	DiscussthepassageoftheHinduCodeBillof1956.

Paper Name: Pedagogy Studies Paper Code: PGVES-205

со	Description: After the completion of the course student will be able
CO1	What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?

CO2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
CO3	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Paper Name: Stress Management by Yoga Paper Code: PGVES-205

со	Description: After the completion of the course student will be able
CO1	Develop healthy mind in a healthy body thus improving social health also
CO2	Improve efficiency

Paper Name: Personality Development through Life Enlightenment Skills Paper Code: PGVES-205

со	Description: After the completion of the course student will be able
CO1	Study of Shrimad-Bhagwad- Geeta will help the student in developing his personality and achieve the highest goal in life

CO2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity
CO3	Study of Neetishatakam will help in developing the versatile personality of students.

Programme Name: B. Sc (Food Science & Nutrition) Syllabus link: http://makautexam.net/aicte_details/SyllabusI/BSCFSN/AllSem21.pdf

Paper Name: Food Microbiology Paper Code: BSUFSN-101

СО	Description: After the completion of the course student will be able
CO1	Know the different types and morphology of microorganisms and magnification capacity of different types of microscopes.
CO2	Understand the factors affecting the growth in controlling the growth curve of microorganisms.
CO3	Able to preserve the perishable foods from different types of microbial spoilage.
CO4	Able to preserve the non-perishable foods from microbial contamination and spoilage.
CO5	Explore the beneficial effects of microorganisms in the processing and development of fermented foods.

Paper Name: Human Physiology I Paper Code: BSUFSN-102
со	Description: After the completion of the course student will be able
CO1	Know the structure of cells and its different parts including their functions.
CO2	Understand the function, structure and mechanism of the Circulatory and Cardiovascular system.
CO3	Impart basic knowledge about the structure and function of the digestive system.
CO4	Acquaint with the basic concepts of Respiratory System
CO5	Develop knowledge of formation and function of Musculoskeletal System

Paper Name: Food Microbiology Lab Paper Code: BSUFSN-191

со	Description: After the completion of the course student will be able
CO1	Know about equipment in a microbiology lab- microscope.

CO2	Prepare laboratory media and special media, cultivation of bacteria, yeasts and molds.
CO3	Know about staining of bacteria.
CO4	Know about Cultivation and identifications of important molds and yeast in food items.
CO5	Can study of bacterial growth: Growth curve

Paper Name: Human Physiology I Lab Paper Code: BSUFSN-192

СО	Description: After the completion of the course student will be able
CO1	Able to measure of blood pressure
CO2	Able to determine pulse rate in resting condition and after exercise.
CO3	Can measure Bleeding Time (BT) and Clotting Time (CT).

CO4	Able to Measure Peak Expiratory flow rate.
CO5	Can identify all the blood cells by study of peripheral blood smear.

Paper Name: English Communication Skill Paper Code: BSUFSN-104

со	Description: After the completion of the course student will be able
CO1	Use the English grammar correctly in order to make an error-free communication.
CO2	Enrich their vocabulary and use them effectively and appropriately.
CO3	Use their writing skill to set a positive impression for them.

CO4	Become confident in group discussion. By looking at various scenarios, a student will learn key language for group discussion as well as gain some business etiquette
CO5	Improve confidence in the personal interview, job interview, or any kind of presentation.
CO6	Apply the four language skills to communicate more effectively and properly.

Paper Name: Introduction to Applied Mathematics Paper Code: BSUFSN-181

СО	Description: After the completion of the course student will be able
CO1	To train the student for making their decision making capability more strong
CO2	To strong in different tools and techniques for industrial problem solving

Paper Name: Nutritional Biochemistry Paper Code: BSUFSN-201

со	Description: After the completion of the course student will be able
CO1	Understanding of the basics about energy metabolism, measurement of energy and calorific value, BMR and the factors affecting the same, insights about nutrition and health.
CO2	To impart basic knowledge about the structure, function and metabolism of carbohydrate, lipid, amino acid, protein and nucleic acid.
CO3	To impart basic knowledge about the structure, function and metabolism of vitamins, hormones and water.
CO4	To impart the basic concepts and functions of different enzymes and various coenzymes.

Paper Name: Human Physiology II Paper Code: BSUFSN-202

со	Description: After the completion of the course student will be able
CO1	Know the structure and function of Excretory system

CO2	Understand the structure and function of the Reproductive system.
CO3	Develop the concept of the Nervous System and its functions.
CO4	Acquaint with the structure and functions of Endocrine System

Paper Name: Nutritional Biochemistry Lab Paper Code: BSUFSN-291

со	Description: After the completion of the course student will be able
CO1	Able to Estimate Protein (Biuret method and Lowry method)
CO2	Able to Estimate blood Glucose (Folin Wu method)
CO3	Able to Estimate inorganic phosphorus
CO4	Able to Estimate blood creatinine

CO5	Test for carbohydrate, protein, lipid
CO6	Able to Estimate Vitamin C, Amylase, Lipase
C07	Determine of BOD (biological oxygen demand)/ COD in waste water

Paper Name: Human Physiology II Lab Paper Code: BSUFSN-292

СО	Description: After the completion of the course student will be able
CO1	Able to detect of Blood group (Slide method).
CO2	Interpretation of normal ECG curve with 6 chest leads
CO3	Identification with reasons of histological slides (Lung, Liver, Kidney, Small intestine, Stomach, Thyroid, Adrenal, Pancreas, Testis, Ovary and Muscle of mammals).
CO4	ABle to estimate of hemoglobin, RBC, WBC and ESR.

Paper Name: Environmental Science Paper Code: BSUFSN-204

со	Description: After the completion of the course student will be able
CO1	Gain in-depth knowledge on natural processes that sustain life, and govern the economy.
CO2	Predict the consequences of human actions on the web of life, global economy and quality of human life.
CO3	Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.
CO4	Acquire values and attitudes towards understanding complex environmental-economic social challenges, and participating actively in solving current environmental problems and preventing the future ones.
CO5	Adopt sustainability as a practice in life, society and industry.

Paper Name: Basic Food Science I Paper Code: BSUFSN-301

со	Description: After the completion of the course student will be able
CO1	Understand the food groups and their functions
CO2	Know about carbohydrates
CO3	Familiarize yourself with proteins.
CO4	Acquaint yourself with lipids.

Paper Name: Food Preservation Paper Code: BSUFSN-302

СО	Description: After the completion of the course student will be able
CO1	Develop basic ideas of food preservation and composition, manufacture, selection, cost, storage, uses and nutritional aspects.
CO2	Know the various Processing of fruits and vegetables products.

CO3	Impart basic idea about meat, fish, poultry and egg processing
CO4	Impart basic knowledge about the Food Standards

Paper Name: Research Methodology and Biostatistics Paper Code: BSUFSN-303

со	Description: After the completion of the course student will be able
CO1	Develop the ability to apply the methods while working on a research project work
CO2	Describe the appropriate statistical methods required for a particular research design
CO3	Choose the appropriate research design and develop appropriate research hypothesis for a research project
CO4	Know how to analyze the data

CO5	Develop a appropriate framework for report writing
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Paper Name: Basic Food Science I Lab Paper Code: BSUFSN-391

СО	Description: After the completion of the course student will be able
CO1	Estimate of Reducing and Non Reducing sugar.
CO2	Estimate of Proteins by Kjeldhal method.
CO3	Identify and estimate of Proteins & amino acids
CO4	Estimate of fat.
CO5	Estimate of calorific value.

Paper Name: Food Preservation Lab Paper Code: BSUFSN-392

со	Description: After the completion of the course student will be able
CO1	Know about different methods of Food preservation – Drying, Freezing, Frying, canning, bottling etc.
CO2	Aseptic handling: Sources of contamination of foods.
CO3	Prepare pickles, tomato sauce, chili sauce, jelly, tomato puree, squashes etc.
CO4	Sauerkraut, Potato chips preparation.
CO5	Know drying of Peas.

Paper Name: Sports Nutrition Paper Code: BSUFSN-305

со	Description: After the completion of the course student will be able
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CO1	Acquaint with the sports nutrition
CO2	Know the benefits of physical activity and exercise
CO3	Familiarize with the classification of Sports activities
CO4	Know the nutritional requirements of sports person
CO5	Impart basic knowledge about Pre- event meals and diets for athletes.

Paper Name: Basic Food Science II Paper Code: BSUFSN-401

со	Description: After the completion of the course student will be able
CO1	Know about food component Minerals
CO2	Acquaint with food component Vitamins

CO3	Familiarize with food component Dietary Fiber
CO4	Understand the food component Water

Paper Name: Community Nutrition Paper Code: BSUFSN-402

со	Description: After the completion of the course student will be able
CO1	Acquaint with the community
CO2	Know the nutritional assessment
CO3	Familiarize with the different assessment methods
CO4	Impart basic knowledge of diet
CO5	Identify some deficiency syndromes

CO6	Know the measurement techniques
CO7	Acquainted with the regional agencies and organizations and their duties.

Paper Name: Human Nutrition I Paper Code: BSUFSN-403

со	Description: After the completion of the course student will be able
CO1	Impart basic knowledge about nutrition.
CO2	Understand the nutritional requirements.
CO3	Idea of the energy in human nutrition.
CO4	Develop knowledge of growth and development
CO5	Monitoring the growth.

Paper Name: Basic Food Science II Lab

Paper Code: BSUFSN-491

СО	Description: After the completion of the course student will be able
CO1	Determine of Moisture content in food.
CO2	Determine Total Ash content and acid insoluble ash in food.
CO3	Determine calcium in food.
CO4	Determine the iron content in food.
CO5	Estimate of crude fiber in food.

Paper Name: Community Nutrition Lab Paper Code: BSUFSN-492

СО	Description: After the completion of the course student will be able
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CO1	Identification of vulnerable and risk groups through nutrition surveys.
CO2	breast-feeding and weaning practices of specific groups through diet survey
CO3	Anthropometric measurement in children. Length, weight, circumference of chest, mid upper arm circumference, precautions to be taken.
CO4	Comparison with norms and interpretation of the nutritional assessment data and its significance. Weight for age, height for age, weight for height, body Mass Index (BMI), Waist - Hip Ratio (WHR), Skin fold thickness
CO5	Growth charts - plotting of growth charts, growth monitoring and promotion.
CO6	Clinical assessment and signs of nutrient deficiencies specially PEM (Kwashiorkor, marasmus) I vitamin A deficiencies, Anaemia, Rickets, B-Complex deficiencies.
CO7	Observe nutritional deficiencies.

Paper Name: Human Nutrition I Lab Paper Code: BSUFSN-493

со	Description: After the completion of the course student will be able
CO1	Uses and cares of kitchen equipment.
CO2	Process involved in cooking: pressure cooking, microwave, steaming, grilling ,deep fat frying.
CO3	General ideas of weights and measures. Eye estimation of raw and cooked foods.
CO4	Preparation of food from different food groups and their effect on health.
CO5	Preparation of supplementary food for different age groups and their nutritional significance.
CO6	Planning and preparation of nutritious but low cost diets.

Paper Name: Food Service Management Paper Code: BSUFSN-405

со	Description: After the completion of the course student will be able
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CO1	Gain knowledge about various types of food services
CO2	Familiarize yourself with preparation, cleaning. storing, serving and planning a food serving unit
CO3	Develop knowledge of menu planning
CO4	Idea of food service
CO5	Realize the importance of sanitation and hygiene in food service institutions.
CO6	Understand about personnel Management, financial management and legal aspects of catering.

Paper Name: Human Nutrition II Paper Code: BSUFSN-501

со	Description: After the completion of the course student will be able
CO1	To understand the health problems associated with nutrient deficiency or toxicity.

CO2	The importance of diet in maintaining human health and leading an active lifestyle.
CO3	To highlight the physiological and metabolic role of nutrients and their relationship to human health and wellbeing
CO4	The concept of diet therapy in treatment and management of nutritional disorders.
CO5	To understand the essential nutrients in growth and development of children.

Paper Name: Diet Therapy I Paper Code: BSUFSN-502

со	Description: After the completion of the course student will be able
CO1	To know the Basic concepts of diet therapy.
CO2	To know the Team approach to health care.
CO3	To know the Routine Hospital Diets.

CO4	To know the Diets for different febrile conditions.
CO5	To know the Etiological factors, symptoms, and Management.
CO6	To know the Diseases of the liver and Biliary System. Dietary Management.

Paper Name: Human Nutrition II Lab Paper Code: BSUFSN-591

СО	Description: After the completion of the course student will be able
CO1	Able to understand the standardization of raw and cooked foods. 1. Cereal and Pulse- Rice, Upma, Phulka, Chapati, Kichidi, Idli, Dosa, Dhal with Green Leafy Vegetable
CO2	About Beverages and Desserts - Tea, Soup, Juices, Milk Shakes, Porridges, Plain Custard
CO3	About Vegetables and fruits- Vegetable curries and salads.
CO4	Know about how to plan and prepare of adequate meal for different age groups with special reference to different physiological

conditions: a) Infants, b) Pre-schooler, c) School children, d)
Adolescents, e) Adults, f) Pregnancy, g) Lactation h) Old age.

Paper Name: Diet Therapy I Lab Paper Code: BSUFSN-592

СО	Description: After the completion of the course student will be able
CO1	Know about planning and preparation of normal diets
CO2	Know about planning and preparation of fluid diets.
CO3	Know about planning and preparation of soft/semi solid diets.
CO4	Know about planning, preparation and calculation of diets in fever and infections.
CO5	Know about planning, preparation and calculation of diets for insulin dependent Diabetes mellitus, Planning, snacks, desserts and beverages for diabetes.
CO6	Know about planning, preparation and calculation of diet in cardiovascular diseases.

C07	Know about planning, preparations and calculation of diet in Kidney failure, Kidney transplant, Renal complication & Kidney stones.
CO8	Know about planning, preparations and calculation of diet in Cancer, Trauma (burns) & Surgery.

Paper Name: Diet Therapy II Paper Code: BSUFSN-601

СО	Description: After the completion of the course student will be able
CO1	To understand Energy modifications and nutritional care for weight management.
CO2	To gather the knowledge of Diet in disease of the endocrine pancreas and according diet plan.
CO3	To make an idea about different common diseases in daily lifestyle such as Hypertension, Diseases of the cardiovascular system, ischemia, angina pectoris, myocardial infarction, heart attack and stroke.
CO4	To know Renal Diseases, their causes, symptoms, Dietary Management.

Paper Name: Geriatric Nutrition Paper Code: BSUFSN-602

со	Description: After the completion of the course student will be able
CO1	To know the gerontology, geriatrics, and geriatric nutrition.
CO2	To know the Physiological and biochemical changes during old age.
CO3	To know the nutritional status of older adults.
CO4	To understand Nutritional requirements and general dietary guidelines for elderly people.
CO5	To know the Major nutritional and health problems during old age.

Paper Name: Diet Therapy II Lab Paper Code: BSUFSN-691

CO1	Know how to Plan and prepare Diets for the following diseases:
	i. Obesity and Underweight.
	ii. Diabetes mellitus.
	iii. Hypertension and Atherosclerosis.
	iv. Acute and chronic glomerulonephritis.
	v. Gout.
	vi. Osteoporosis.

Paper Name: Geriatric Nutrition Lab Paper Code: BSUFSN-692

со	Description: After the completion of the course student will be able
CO1	To know the cause of visiting old- age homes.
CO2	To Prepare of dishes suitable for older person a) Soft, b) Semisolid c) Liquid d) Easily digestible balanced diet.

Programme Name: B. Sc. In Robotics& 3D Printing Syllabus link: http://makautexam.net/aicte_details/Syllabusl/BSCR3DP/sem120.pdf

Paper Name: Basic Electrical Engineering Paper Code: RB-EE 101

СО	Description: After the completion of the course student will be able
CO1	Classify of Electrical Elements and Energy Sources.
CO2	Solve simple DC Circuits and Network Theorems.
CO3	Analyze RLC Combination in Time Domain.
CO4	Specify a Sinusoidal Waveform with drawing phasor diagram.
CO5	Classify Power and determine Power Factor.
CO6	Solve AC RLC Series-Parallel Combination problems.
CO7	Analyze Three Phase balanced circuits.

CO8	Specify in detail ideal and practical transformers.
CO9	Calculate parameters of transformers.
CO10	Performance and application of Autotransformer and three phase connections.
CO11	Concept of generation of magnetic field.
CO12	Calculate parameters of Three Phase Induction Motor and analyze performance.
CO13	Calculate parameters of Single Phase Induction Motor and analyze performance.
CO14	Calculate parameters of Separately Excited DC Motor and analyze performance.
CO15	Calculate parameters of Synchronous Generator and analyze performance.
CO16	Classify Power Converters and analyze performance of power converters.

CO17	Identification of LT Switchgear, Circuit Breaker and Earthing and their application.
CO18	Identify Wires and Cables.
CO19	Calculate parameters of Battery and its performance analysis.

Paper Name: Basic Electrical Engineering Lab Paper Code: RBEE191

со	Description: After the completion of the course student will be able
CO1	Identify and use Electrical Elements and Measuring Instruments.
CO2	Measure Time Response of RLC Circuits and Resonance.
CO3	Analyze performance of Single Phase Transformer.
CO4	Analyze performance of Three Phase Transformer.

CO5	Identify parts of DC Machines, Induction Machine, Synchronous Machine, Single Phase Induction Machine.
CO6	Analyze performance of Induction Motor.
C07	Analyze performance of DC Motor.
CO8	Identify LT Switchgears.

Paper Name: Engineering Mechanics Paper Code: RBMS101

со	Description: After the completion of the course student will be able
CO1	Draw free body diagrams and determine the resultant of forces and/or moments.
CO2	Analyze the rigid body in equilibrium.

CO3	Determine the centroid and second moment of area of sections.
CO4	Apply laws of mechanics to determine efficiency of simple machines with consideration of friction.
CO5	Analyze the motion and calculate trajectory characteristics.
CO6	Determine the friction force and the effects by the use of laws of friction, also determine the Rolling resistance and Translation and Rotation of the Rigid Bodies.

Paper Name: Engineering Graphics Paper Code: RBMS191

со	Description: After the completion of the course student will be able
CO1	Familiarize with the fundamentals and standards of Engineering graphics
CO2	perform freehand sketching of basic geometrical constructions and multiple views of objects.
CO3	Project orthographic projections of lines and plane surfaces.

CO4	Draw projections and solids and development of surfaces.
CO5	visualize and to project isometric and perspective sections of simple solids.
CO6	Ability to visualize the pictorial view and draw orthographic projection on reference planes including sections by using AutoCAD.
C07	Ability to draw 2D & 3D Objects in Autocad.

Paper Name: Communicative English Paper Code: RB-HU 101

со	Description: After the completion of the course student will be able
CO1	Comprehend conversations and short talks delivered in English
CO2	Write short essays of a general kind and personal letters and emails in English
CO3	Prepare technical reports and short essays

CO4	Students will be able to Learn basic do's and don'ts of an interview.
CO5	students will be able to speak in English.

Syllabus link: http://makautexam.net/aicte_details/Syllabusl/BSCR3DP/sem220.pdf

Paper Name: Analog & Digital Electronics Paper Code: RBEC201

со	Description: After the completion of the course student will be able
CO1	Realize the basic operations of different analog components.
CO2	Realize basic gate operations and laws Boolean algebra.
CO3	Understand basic structure of digital computer, stored program concept and different arithmetic and control unit operations.

Paper Name: Analog & Digital Electronics lab Paper Code: RBEC291

со	Description: After the completion of the course student will be able
CO1	Learn the basics of gates.
CO2	Construct basic combinational circuits and verify their functionalities
CO3	Apply the design procedures to design basic sequential circuits
CO4	Learn about counters
CO5	Learn about Shift registers
CO6	To understand the basic digital circuits and to verify their operation

Paper Name: Strength of Materials for Mechanical Engineers Paper Code: RB-MS201

со	Description: After the completion of the course student will be able
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CO1	Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.
CO2	Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
CO3	Apply basic equation of simple torsion in designing of shafts and helical spring
CO4	Calculate the slope and deflection in beams using different methods.
CO5	Analyze and design thin and thick shells for the applied internal and external pressures.

Paper Name: Strength of Materials for Mechanical Engineers Lab Paper Code: RB-MS291

со	Description: After the completion of the course student will be able
CO1	Analyze the tensile and compressive strength of a specimen for applying in a practical design based project work.
CO2	Determine the hardness, impact strength, fatigue strength to analyze the application of a specific material for a given design

	requirements for different loading conditions of structures or machines.
CO3	Understanding the bending in beams and to analyze the bending stresses which further build the foundation of using modern analysis software.
CO4	Evaluate the capacity of a material to withstand torsional stresses for a safe and sustainable design of machine elements.

Paper Name: Environmental Science Paper Code: RB-PR 201

со	Description: After the completion of the course student will be able
CO1	Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environment. One will obtain knowledge on the following after completing the course.
CO2	Public awareness of the environment is at an infant stage.
CO3	Ignorance and incomplete knowledge has lead to misconceptions

CO4	Development and improvement in std. of living has lead to serious environmental disasters

Syllabus link: http://makautexam.net/aicte_details/Syllabusl/BSCR3DP/sem320.pdf Paper Name: Electrical Machines Paper Code: RBEC301

со	Description: After the completion of the course student will be able
CO1	Understanding the principles of operations and characteristics of DC machines
CO2	Knowledge of electrical transformers and induction motors
CO3	Know about the different types of induction motors
CO4	Able to visualize the operation of synchronous motors stepper and servo motors.
CO5	Comprehending the power transmission and distribution systems.
Paper Name: Electrical Machines Lab Paper Code: RBEC391

со	Description: After the completion of the course student will be able
CO1	Knowledge about the basic operation of electrical machines and help them to develop experimental skills.
CO2	Ability to verify the circuit laws and theorems and measure the circuit parameter.
CO3	Ability to operate electrical machines.
CO4	Ability to construct a Single Phase ,Three Phase Induction Motor with Loading Arrangement and to operate switches
CO5	Ability to determine the equivalent circuit parameters.

Paper Name: Microprocessors, Embedded Controllers and Real time Operating Systems Paper Code: RB-EC301

со	Description: After the completion of the course student will
	be able

CO1	Design and implement programs on 8085 microprocessors.
CO2	Design and implement programs on 8086 microprocessors.
CO3	Design I/O circuits.
CO4	Design Memory Interfacing circuits.
CO5	Design and implement 8051 microcontroller based systems.

Paper Name: Microprocessors, Embedded Controllers and Real time Operating Systems lab Paper Code: RBEC392

со	Description: After the completion of the course student will be able
CO1	Identify the general computing system and the embedded system, also recognize the classification of embedded systems.
CO2	Analyze the architecture of the processor and its programming aspects (assembly level).

CO3	Explain the ability to interface external devices with microcontrollers.
CO4	Design real time embedded systems using the concepts of RTOS
CO5	Design and implement microcontroller based embedded systems.

Paper Name: Kinematics & Dynamics of Machines Paper Code: RB-MS301

со	Description: After the completion of the course student will be able
CO1	the students be able to understand the basic knowledge of kinematics of machines
CO2	Students can able to apply fundamentals of mechanism for the design of new mechanisms
CO3	Able to know about the linkages, design few linkage mechanisms and cam mechanisms for specified output motions.
CO4	Impart knowledge about the gears and gear trains.

CO5	Ability to analyze them for optimum design.
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Paper Name: Kinematics & Dynamics of Machines lab Paper Code: RBMS391

СО	Description: After the completion of the course student will be able
CO1	Ability to demonstrate the principles of kinematics and dynamics of machinery
CO2	Ability to use the measuring devices for dynamic testing.

Paper Name: Introduction to python Paper Code: RBCS301

со	Description: After the completion of the course student will be able
CO1	To acquire programming skills in core Python.
CO2	To acquire Object Oriented Skills in Python

CO3	To develop the skill of designing Graphical user Interfaces in Python
CO4	To develop the ability to write database applications in Python

Syllabus link: http://makautexam.net/aicte_details/Syllabusl/BSCR3DP/sem420.pdf

Paper Name: Power Electronics and Drives Paper Code: RBEE401

со	Description: After the completion of the course student will be able
CO1	Ability to explain various devices and their structure, operating characteristics in the field of electronics.
CO2	Ability to classify, analyze and design, Control rectifier, chopper and inverter.
CO3	Will have ability to apply power electronic circuits for the control of popular applications.
CO4	Exposure to design and analyze PE circuit using simulation software.

Paper Name: Power Electronics and Drives Lab Paper Code: RBEE491

со	Description: After the completion of the course student will be able
CO1	Ability to practice and understand converter and inverter circuits and apply software for engineering problems.
CO2	Ability to experiment about switching characteristics of various switches.
CO3	Ability to analyze AC to DC converter circuits.
CO4	Ability to analyze DC to AC circuits.
CO5	Ability to acquire knowledge on AC to AC converters
CO6	Ability to acquire knowledge on simulation software.

Paper Name: Sensors and Instrumentation Paper Code: RB-EC401

со	Description: After the completion of the course student will be able
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CO1	Familiar with various calibration techniques and signal types for sensors.
CO2	Apply the various sensors in the Automotive and Mechatronics applications
CO3	Describe the working principle and characteristics of force, magnetic and heading sensors.
CO4	Understand the basic principles of various pressure and temperature, smart sensors.
CO5	Ability to implement the DAQ systems with different sensors for real time applications.

Paper Name: Sensors & Instrumentation Lab Paper Code: RB-EC491

СО	Description: After the completion of the course student will be able
CO1	To discuss role of Sensor in instrumentation
CO2	To discuss bimetallic and temperature measurement systems.

CO3	To discuss Sensors & Instrumentation in detail.
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Paper Name: Principles of Robotics I Paper Code: RBPR401

со	Description: After the completion of the course student will be able
CO1	Ability to understand basic concepts of robotics.
CO2	To analyze Instrumentation systems and their applications to various
CO3	To know about the differential motion and statics in robotics
CO4	To know about the various path planning techniques.
CO5	To know about the dynamics and control in robotics industries.

Paper Name: Principle Robotics Lab I Paper Code: RBPR491

СО	Description: After the completion of the course student will be able
CO1	Use of any robotic simulation software to model the different types of robots and calculate work volume for different robots

Paper Name: Machine Learning Paper Code: RBCS401

со	Description: After the completion of the course student will be able
CO1	Develop an appreciation for what is involved in Learning models from data
CO2	Understand the features of machine learning to apply on real world problems
CO3	Characterize the machine learning algorithms as supervised learning and unsupervised learning and Apply and analyze the various algorithms of supervised and unsupervised learning
CO4	Analyze the concept of neural networks for learning linear and non- linear activation functions

CO5	Learn the concepts in Bayesian analysis from probability models and methods
CO6	Understand the fundamental concepts of Genetic Algorithm and Analyze and design the genetic algorithms for optimization engineering problems

Syllabus link: http://makautexam.net/aicte_details/Syllabusl/BSCR3DP/sem520.pdf Paper Name: Control System Paper Code: RB-EE501

со	Description: After the completion of the course student will be able
CO1	To understand the basic of the control system
CO2	Ability to know about the time and frequency domain analysis
CO3	To know about the different stability of the systems

CO4	To expose students to the state space representation and its analysis.
CO5	To introduce non-linear systems and their control and to impart knowledge on advanced control techniques

Paper Name: Control System Lab Paper Code: RB-EE591

со	Description: After the completion of the course student will be able
CO1	Identify appropriate equipment and instruments for the experiment.
CO2	Test the instrument for application to the experiment.
CO3	construct circuits with appropriate instruments and safety precautions.
CO4	use MAT-Lab control system tool box, MAT-Lab- simulink tool box & PSPICE for simulation of systems.
CO5	determinecontrol system specifications of first and second order systems.

Paper Name: Introduction to Robotics II Paper Code: RB-PR501

СО	Description: After the completion of the course student will be able
CO1	Explain the basic concepts of working of robot
CO2	Analyze the function of sensors in the robot
CO3	Write program to use a robot for a typical application
CO4	Use Robots in different applications
CO5	Know about humanoid robots.

Paper Name: Introduction to Robotics II Lab Paper Code: RB-PR591

со	Description: After the completion of the course student will be able
CO1	understand the fundamentals of autonomous robot operation, and be able to program a robot to read from its sensors and perform simple (hard-coded and learned) tasks.

Syllabus link: http://makautexam.net/aicte_details/Syllabusl/BSCR3DP/sem620.pdf Paper Name: 3D Printing Paper Code: RBPR601

со	Description: After the completion of the course student will be able
CO1	Develop CAD models for 3D printing.
CO2	Import and Export CAD data and generate .stl file.
CO3	Select a specific material for the given application.
CO4	Select a 3D printing process for an application.
CO5	Produce a product using 3D Printing or Additive Manufacturing (AM).

Paper Name: 3D Printing Lab Paper Code: RBPR691

СО	Description: After the completion of the course student will be able
CO1	To create a bot using recorders (Smart, Web and Screen).
CO2	To create a bot using command library – (Loop Command).
CO3	To create a bot to invoke database automation
CO4	To create a bot for automating excel operations
CO5	To create a bot for PDF Integrations.
CO6	To create a bot and working on error handling.
C07	To create a bot develop using Object Cloning Command.
CO8	FTP and PGB Command Execution by Bots

CO9	MetaBot Designing with AI Sense.
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Paper Name: Machine Vision Paper Code: RB-CS601

со	Description: After the completion of the course student will be able
CO1	Knowledge or gadgets of vision systems
CO2	Ability to understand the image capturing and processing techniques
CO3	Ability to apply the vision system in other machines
CO4	Knowledge for recognizing the objects.
CO5	Knowledge in application of vision and image processing in robot operations.

Paper Name: Machine Vision Lab Paper Code: RB-CS691

СО	Description: After the completion of the course student will be able
CO1	Understand the mathematical and statistical perspectives of machine learning algorithms through python programming.
CO2	Design and evaluate the unsupervised models through python in built functions.
CO3	Evaluate the machine learning models pre-processed through various feature engineering algorithms by python programming.
CO4	Design and apply various reinforcement algorithms to solve real time complex problems.
CO5	Design and develop the code for recommender system using Natural Language processing
CO6	Understand the basic concepts of deep neural network models and design the same.

Programme Name: B.Sc. in Information Technology (Artificial Intelligence) Syllabus link: http://makautexam.net/aicte_details/Syllabusl/BSCITAI/AllSem20.pdf

Paper Name: Programming Fundamental Paper Code: BITAIC101

СО	Description: After the completion of the course student will be able
CO1	Simple programs to understand the concepts of data types, operations and expressions
CO2	Familiarizing conditional and control statements.
CO3	Implementing Concept of arrays and String to solve problems.
CO4	Implementation of functions, pointers, operation on pointers and dynamic storage allocation.
CO5	Defining and handling structures, array of structures, union and processing data

Paper Name: Discrete Structures Paper Code: BITAIC102

СО	Description: After the completion of the course student will be able
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CO1	Express a logic sentence in terms of predicates, quantifiers and logical connectives.
CO2	Derive the solution for a given problem using deductive logic and prove the solution based on logical inference
CO3	Classify its algebraic structure for a given mathematical problem
CO4	Evaluate Boolean functions and simplify expressions using the properties of Boolean Algebra.
CO5	Develop the given problem as graph networks and solve them with techniques of graph theory.

Paper Name: Soft skills Paper Code: BITAIA101

со	Description: After the completion of the course student will be able
CO1	Understand importance of self-awareness, values and leadership skills in capacity buir
CO2	Understand and analyze the factors affecting interpersonal skills

CO3	Understand and evaluate the concepts of vision, mission and goals for corporate skills
CO4	Understand, apply and analyse the importance of body language, time management and stress management
CO5	Understand the concept and need for self development plan

Paper Name: Programming Fundamentals Lab Paper Code: BITAIC191

со	Description: After the completion of the course student will be able
CO1	Simple programs to understand the concepts of data types, operations and expressions.
CO2	Familiarizing conditional and control statements.
CO3	Implementing Concept of arrays and String to solve problems.
CO4	Implementation of functions, pointers, operation on pointers and dynamic storage allocation.

CO5	Defining and handling structures, array of structures, union and processing data

Paper Name: Discrete Structures Lab Paper Code: BITAIC192

СО	Description: After the completion of the course student will be able
CO1	To develop understanding of Logic Sets and Functions.
CO2	To use mathematical reasoning techniques including induction and recursion
CO3	To understand and apply counting techniques to the representation and characterization of relational concepts.
CO4	To develop an understanding of how graph and tree concepts are used to solve problems arising in computer science.
CO5	To communicate the solutions of technical problems to other professionals.
CO6	To develop improved collaborative skills.

Paper Name: Data Structures with python Paper Code: BITAIC201

со	Description: After the completion of the course student will be able
CO1	Define data structures like array, stack, queues and linked list.
CO2	Explain insertion, deletion and traversing operations on data structures.
CO3	Identify the asymptotic notations to find the complexity of an algorithm.
CO4	Compare various searching and sorting techniques
CO5	Choose appropriate data structure while designing the algorithms.
CO6	Design advanced data structures using non linear data structures.

Paper Name: ata Structure and Algorithm with Python Lab Paper Code: BITAIC291

СО	Description: After the completion of the course student will be able
CO1	Represent data for efficient processing using the fundamental concept of Data Structure.
CO2	Develop applications using the search algorithms and sorting algorithms based on their time complexities.
CO3	Develop applications using the concepts of linear data structure like stack, queue and Linked List for different requirements.
CO4	Implement non-linear data structures like trees and graphs.
CO5	Design the application using the data structure that efficiently models the information in a problem.

Paper Name: Operating System Paper Code: BITAIC202

со	Description: After the completion of the course student will be able
CO1	Analyze the drawbacks of Procedure Oriented Programming compared with the concepts of Object-Oriented Programming paradigm & C++ language features in program design.

CO2	Identify the role of Classes & Objects, constructors & destructors in program design
CO3	Design various forms of inheritance and analyze how base class constructors are called.
CO4	Evaluate operator overloading and runtime polymorphism Programming through examples.
CO5	Explore exception handling and various Stream classes and I/O operations in handling file operations.
CO6	Students will be able to create and user interfaces and packages and be able to demonstrate programs on exceptions, multithreading and applets.

Paper Name: Operating System Lab Paper Code: BITAIC292

со	Description: After the completion of the course student will be able
CO1	Programming in C to implement FCFS, SJF, RR, SRTF, HRRN
CO2	Programming in C to implement Deadlock Avoidance and Deadlock Prevention

CO3	Understand the fundamental concept of shell script.
CO4	Apply the concepts of operators in shell script
CO5	Apply the concept of Loop, Array, Function in shell script

Paper Name: Environmental Science Paper Code: BITAIA201

СО	Description: After the completion of the course student will be able
CO1	describe the natural environment and its relationships with human activities
CO2	learn fundamental Knowledge of science and engineering to assess environmental and health risk
CO3	develop guidelines and procedures for health and safety issues obeying environmental laws and regulations
CO4	acquire skills for scientific problem-solving related to air, water, noise & land pollution

CO5	gain knowledge how to perform EIA, Environmental Audit to assess the impact and further development

Paper Name: Database Management System Paper Code: BITAIC301

со	Description: After the completion of the course student will be able
CO1	Illustrate the different components of database and data model
CO2	Design the databases using E R method and normalization for a given specification of the requirement
CO3	Construct the SQL queries for Open source and Commercial DBMS - MYSQL, ORACLE, and DB2.
CO4	Optimize query execution using Query optimization algorithms
CO5	Determine the transaction atomicity, consistency, isolation, and durability for a given transaction-processing system
CO6	Justify the ACID property based on locking, time stamping algorithm on concurrency control and Serializability of scheduling.

Paper Name: Database Management System Lab Paper Code: BITAIC391

СО	Description: After the completion of the course student will be able
CO1	Illustrate the different components of database and data model
CO2	Design the databases using E R method and normalization for a given specification of the requirement
CO3	Construct the SQL queries for Open source and Commercial DBMS - MYSQL, ORACLE, and DB2.
CO4	Optimize query execution using Query optimization algorithms
CO5	Determine the transaction atomicity, consistency, isolation, and durability for a given transaction-processing system.
CO6	Justify the ACID property based on locking, time stamping algorithm on concurrency control and Serializability of scheduling.

Paper Name: Machine Learning Paper Code: BITAIC302

СО	Description: After the completion of the course student will be able
CO1	Learn the basics of learning problems with hypothesis and version spaces
CO2	Understand the features of machine learning to apply on real world problems
CO3	Characterize the machine learning algorithms as supervised learning and unsupervised learning and Apply and analyze the various algorithms of supervised and unsupervised learning
CO4	Analyze the concept of neural networks for learning linear and non- linear activation functions
CO5	Learn the concepts in Bayesian analysis from probability models and methods
CO6	Understand the fundamental concepts of Genetic Algorithm and Analyze and design the genetic algorithms for optimization engineering problems

Paper Name: Machine Learning Lab Paper Code: BITAIC392

со	Description: After the completion of the course student will be able
CO1	Effectively use the various machine learning tools
CO2	Understand and implement the procedures for machine learning algorithms
CO3	Design Python programs for various machine learning algorithms
CO4	Apply appropriate datasets to the Machine Learning algorithms
CO5	Analyze the graphical outcomes of learning algorithms with specific datasets

Paper Name: Artificial Intelligence Paper Code: BITAIC303

со	Description: After the completion of the course student will
	be able

CO1	Understand the informed and uninformed problem types and apply search strategies to solve them.
CO2	Apply difficult real life problems in a state space representation so as to solve them using AI techniques like searching and game playing.
CO3	Design and evaluate intelligent expert models for perception and prediction from an intelligent environment.
CO4	Formulate valid solutions for problems involving uncertain inputs or outcomes by using decision making techniques.
CO5	Demonstrate and enrich knowledge to select and apply AI tools to synthesize information and develop models within constraints of application area.
CO6	Examine the issues involved in knowledge bases, reasoning systems and planning

Paper Name: Object Oriented Programming Paper Code: BITAIS381

со	Description: After the completion of the course student will
	be able

CO1	Analyze the drawbacks of Procedure Oriented Programming compared with the concepts of Object Oriented Programming paradigm & C++ language features in program design.
CO2	Identify the role of Classes & Objects, constructors & destructors in program design
CO3	Design various forms of inheritance and analyze how base class constructors are called.
CO4	Evaluate operator overloading, runtime polymorphism Programming through examples.
CO5	Explore exception handling and various Stream classes, I/O operations in handling file operations.

Paper Name: Computer Networks Paper Code: BITAIC401

со	Description: After the completion of the course student will be able
CO1	Explain the basics of computer networking, different network model and architecture
CO2	Analyze different networking functions and features for identifying optimal solution

CO3	Apply different networking concepts for implementing network solution
CO4	Evaluate and implement routing algorithms for implanting solution for the real life problems
CO5	Develop implement model of fault tolerant computer networks

Paper Name: Computer Networks Lab Paper Code: BITAIC491

со	Description: After the completion of the course student will be able
CO1	Working in a real time environment.
CO2	To calculate the latency related issue easily.
CO3	Troubleshoot the security issues of computer networks.
CO4	To configure and debug various routing algorithms.

CO5 Familiarize the student with the taxonomy and terminology of the computer networking area.
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Paper Name: Software Engineering Paper Code: BITAIC402

СО	Description: After the completion of the course student will be able
CO1	Identify software Engineering problem .specification, performance, maintenance and quality requirements
CO2	Select modern engineering tools necessary for software project management, time management and software reuse
CO3	Analyze, elicit and specify software requirements through a productive working relationship with various stakeholders of the project.
CO4	Distinguish different testing strategies and it's working.
CO5	Design applicable solutions in one or more application domains using software engineering approaches that integrates ethical, social, legal and economic concerns

CO6	Develop the code from the design and effectively apply relevant
	practice.

Paper Name: Software Engineering Lab Paper Code: BITAIC492

со	Description: After the completion of the course student will be able
CO1	Demonstrate knowledge of the wider software engineering context, software engineering processes and their applicability
CO2	Understand a problem domain and to elicit, analyze, and specify the requirements of a software system solution.
CO3	Describe and formulate test cases to perform different levels of testing
CO4	Identify and outline specific components of a software design that can be targeted for reuse.
CO5	Use the Agile process to develop a quality software product
CO6	Analyze the engineering problems encountered in system and software development

Paper Name: Data Visualisation Paper Code: BITAIC403

со	Description: After the completion of the course student will be able
CO1	know the history of data visualization and its connection with computer graphics
CO2	understand the visualization pipeline with its relationship to other data analysis pipelines
CO3	understand the types of transformation the data has undergone to improve the effectiveness of the visualization
CO4	know approaches to understand visual perception, cognitive issues and recognition of visuals
CO5	understand the techniques that have been applied to spatial data
CO6	demonstrate knowledge of basic visualizations for document collections data such as node graphs, ThemeRiver, Calendar View

Paper Name: Data Visualisation Lab

Paper Code: BITAIC493

со	Description: After the completion of the course student will be able
CO1	Understand and describe the main concepts of data visualization
CO2	Create ad-hoc reports, data visualizations, and dashboards using Tableau Desktop
CO3	Publish the created visualizations to Tableau Server and Tableau Public

Paper Name: Deep Learning Paper Code: BITAIC501

со	Description: After the completion of the course student will be able
CO1	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.

CO2	Implement deep learning algorithms and solve real-world problems.
CO3	Solve problems in linear algebra, probability, optimization, and machine learning.
CO4	Evaluate, in the context of a case study, the advantages and disadvantages of deep learning neural network architectures and other approaches.
CO5	Design convolutional networks for handwriting and object classification from images or video.
CO6	Perform regularization, training optimization, and hyperparameter selection on deep models.

Paper Name: Deep Learning Lab Paper Code: BITAIC591

со	Description: After the completion of the course student will be able
CO1	Apply various pre-processing techniques on different datasets.
CO2	Develop Deep learning programs for Supervised & Unsupervised learning models.
CO3	Identify and Apply Artificial Intelligence concepts to solve real world problems.
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Paper Name: Image Processing Paper Code: BITAIC502

со	Description: After the completion of the course student will be able
CO1	Review the fundamental concepts of a digital image processing system.
CO2	Evaluate the techniques for image enhancement and image restoration.
CO3	Analyze the utility of wavelet decompositions and their role in image processing systems.
CO4	Elucidate the mathematical modeling of image morphology.
CO5	Interpret image segmentation and representation techniques
CO6	Design algorithms to solve image processing problems and meet design specifications.

Paper Name: Image Processing Lab Paper Code: BITAIC592

со	Description: After the completion of the course student will be able
CO1	Analyze the problem and convert the image into the desired domain for analysis.
CO2	Analyze the need of image enhancement in spatial and Fourier domain.
CO3	Frame the design according to the type of image domain.
CO4	Integrate various algorithms to find a best fit solution as per the problem among various image processing techniques.
CO5	Develop image processing applications for solving real world problems

Paper Name: Cloud Computing Paper Code: BITAIC601

со	Description: After the completion of the course student will
	be able

CO1	To explore the working of open source and commercial cloud computing platforms
CO2	Selection of a particular deployment model according to scenario
СОЗ	To be able to implement various services on the cloud.
CO4	Design and develop cloud using various cloud platforms.
CO5	Explore the usage of cloud simulation tools and techniques
CO6	Compare and contrast various open and commercial cloud platforms.

Paper Name: Cloud Computing Lab Paper Code: BITAIC691

со	Description: After the completion of the course student will be able
CO1	Configure various virtualization tools such as Virtual Box, VMware workstation

CO2	Design and deploy a web application in a PaaS environment
CO3	Learn how to simulate a cloud environment to implement new schedulers
CO4	Install and use a generic cloud environment that can be used as a private cloud.
CO5	Manipulate large data sets in a parallel environment

Paper Name: Robotics Paper Code: BITAIC602

со	Description: After the completion of the course student will be able
CO1	Demonstrate knowledge of industrial robots, characteristics, end effectors and actuators.
CO2	Apply spatial transformation to obtain forward and inverse kinematics
CO3	Solve robot dynamics problems, generate joint trajectory for path planning

CO4	Describe working principle of various sensors and program different operations
CO5	Appreciate applications of robots in industry.

Paper Name: Robotics Lab Paper Code: BITAIC692

со	Description: After the completion of the course student will be able
CO1	Select an appropriate robot type for a specific manufacturing application.
CO2	Plan robot motions and paths
CO3	Create, modify, and execute different robot programs (Ex. FANUC, Mitsubishi)
CO4	Create MACROs and subprograms to conduct recurring (repetitive) tasks
CO5	Use robot inputs and outputs to control operation sequence

CO6	Design and develop a robotic work cell system for a specific manufacturing application
CO7	Troubleshoot and recover from common robot program errors and faults

Programme Name: B.Sc. in Information Technology (Data Science) Syllabus link: http://makautexam.net/aicte_details/SyllabusI/BSCDS/AllSem20.pdf

Paper Name: Programming Fundamentals Paper Code: BITDSC101

со	Description: After the completion of the course student will be able
CO1	Describe how data are represented, manipulated, and stored in a computer.
CO2	Categorize different programming languages and their uses.
CO3	Understand and use the fundamental concepts of data types, structured programming, algorithmic design, and user interface design.

CO4	Demonstrate a fundamental understanding of software development methodologies, including modular design, pseudo code, flowcharting, structure charts, data types, control structures, functions, and arrays.
CO5	Develop projects that utilize logical algorithms from specifications and requirements statements.
CO6	Demonstrate appropriate design, coding, testing, and documenting of computer programs that implement project specifications and requirements.
CO7	Apply computer programming concepts to new problems or situations.

Paper Name: Programming Fundamentals Lab Paper Code: BITDSC191

со	Description: After the completion of the course student will be able
CO1	Simple programs to understand the concepts of data types, operations and expressions.
CO2	Familiarizing conditional and control statements.
CO3	Implementing Concept of arrays and String to solve problems.

CO4	Implementation of functions, pointers, operation on pointers and dynamic storage allocation.
CO5	Defining and handling structures, array of structures, union and processing data.

Paper Name: Discrete Structures Paper Code: BITDSC102

со	Description: After the completion of the course student will be able
CO1	Demonstrate the solution for a given problem using mathematical procedures.
CO2	Relate to the mathematical tools of logic and induction.
CO3	Discover inductive definitions and proofs, with application to problems in computer science.
CO4	Discuss proofs of partial program correctness, finite state automata and modular arithmetic.
CO5	Inspect theorems concerning relations, functions, and sets.

CO6	Apply mathematical knowledge to problem solving.
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Paper Name: Soft skill Paper Code: BITDSA101

СО	Description: After the completion of the course student will be able
CO1	Understand importance of self-awareness, values and leadership skills in capacity buir.
CO2	Understand and analyze the factors affecting interpersonal skills.
CO3	Understand and evaluate the concepts of vision, mission and goals for corporate skills.
CO4	Understand, apply and analyze the importance of body language, time management and stress management.
CO5	Understand the concept and need for a self development plan.

Paper Name: Data Structure and Algorithm with Python Paper Code: BITDSC201

со	Description: After the completion of the course student will be able
CO1	Learn, implement, and use different Data Structures
CO2	Become a better developer by mastering computer science fundamentals
CO3	Know Recursion
CO4	Learn, implement and use different Algorithms
CO5	Know Time and Space Complexity of Data Structures and Algorithms
CO6	Know Big O

Paper Name: Data Structure and Algorithm with Python Lab Paper Code: BITDSC291

со	Description: After the completion of the course student will be able
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CO1	Understand the concept of data structures, python and apply algorithms for solving problems like Sorting, searching, insertion and deletion of data.
CO2	Understand linear data structures for processing of ordered or unordered data.
CO3	Explore various operations on dynamic data structures like single linked list, circular linked list and doubly linked list.
CO4	Explore the concept of non linear data structures such as trees and graphs.
CO5	Understand the binary search trees, hash function, and concepts of collision and its resolution methods.

Paper Name: Operating System Paper Code: BITDSC202

со	Description: After the completion of the course student will be able
CO1	Explain the structure of different operating systems and different functionalities of it
CO2	Identify process, thread, the communication between application programs and hardware devices through system calls.

CO3	Analyze and CPU scheduling algorithm. Inspect process synchronization and its consequences
CO4	Inspect process synchronization and deadlock.
CO5	Apply different memory management scheme
CO6	Analyze different file systems, I/O devices, disk scheduling and different security vulnerabilities

Paper Name: Operating System Lab Paper Code: BITDSC292

со	Description: After the completion of the course student will be able
CO1	Understand the fundamental concept of shell script.
CO2	Apply the concept of Array in shell script
CO3	Apply the concepts of string in shell script

CO4	Apply the concepts of loop in shell script
CO5	Apply the concepts of string in shell script
CO6	Apply the concepts of function in shell script

Paper Name: Environmental Science Paper Code: BITDSA201

СО	Description: After the completion of the course student will be able
CO1	Understand and evaluate the global scale of environmental problems.
CO2	Reflect critically on their roles, responsibilities, and identities as citizens, consumers and environmental actors in a complex, interconnected world.
CO3	Use critical thinking, problem-solving, and the methodological approaches of the social sciences, natural sciences, and humanities in environmental problem solving.

Paper Name: Database Management System

Paper Code: BITDSC301

со	Description: After the completion of the course student will be able
CO1	For a given problem (requirement specification) design the databases using the E-R diagram method and convert it into Relational Database.
CO2	For a given query write relational algebra and Relational Calculus expressions for that query and optimize the developed expressions.
CO3	For a given specification construct the SQL queries for Open source and Commercial DBMS.
CO4	For a given query, optimize its execution using Query optimization algorithms.
CO5	Understand and implement transaction processing, concurrency control and Recovery systems.
CO6	Understand different types of advanced database and know about database security.

Paper Name: Database Management System Lab Paper Code: BITDSC391

со	Description: After the completion of the course student will be able
CO1	Illustrate different types of SQL commands
CO2	Formulate queries using SQL operators
CO3	Apply different types of joining operation on multiple tables
CO4	Implement various queries using different functions and elaborate nested queries
CO5	Construct Views
CO6	Describe the concept of cursor and triggers

Paper Name: Foundation of Data Science Paper Code: BITDSC302

СО	Description: After the completion of the course student will be able

CO1	Obtain, clean/process, and transform data
CO2	Analyze and interpret data using an ethically responsible approach
CO3	Use appropriate models of analysis, assess the quality of input, derive insight from results, and investigate potential issues
CO4	Apply computing theory, languages, and algorithms, as well as mathematical and statistical models, and the principles of optimization to appropriately formulate and use data analyses
CO5	Formulate and use appropriate models of data analysis to solve hidden solutions to business-related challenges
CO6	Perform well in a group

Paper Name: Data Mining & Data Warehousing Paper Code: BITDSC303

CO1	Understand warehousing architectures and tools for systematically organizing large database and use their data to make strategic decisions.
CO2	Understand the KDD process for finding interesting patterns from the warehouse.
CO3	Remove redundancy and incomplete data from the dataset using data preprocessing methods.
CO4	Characterize the kinds of patterns that can be discovered by association rule mining.
CO5	Discover interesting patterns from large amounts of data to analyze for predictions and classification.
CO6	Develop a data mining application for data analysis using various tools.

Paper Name: Object Oriented Programming Paper Code: BITCSS381

со	Description: After the completion of the course student will be able
CO1	Visualize a given problem scenario in terms of classes and objects.

CO2	Acquire the knowledge about different types of inheritance & polymorphism, interface, package, vector and wrapper class.
CO3	Apply object oriented programming concepts through Java for problem solving.
CO4	Acquire knowledge about threads, thread synchronization and applets and their life cycle.

Paper Name: Computer Networks Paper Code: BITDSC401

СО	Description: After the completion of the course student will be able
CO1	To develop the understanding various IEEE standards for computer networks
CO2	Understanding the Internet protocol in multicasting routing protocols and routing algorithms.
CO3	To learn mechanism for overlay networks and various routing protocols
CO4	To know the multicasting and routing algorithms.

CO5	To acquire the basic network security principle including encryption algorithms
CO6	Examine the issues related to security in computer networks

Paper Name: Computer Networks Lab Paper Code: BITDSC491

со	Description: After the completion of the course student will be able
CO1	Working in a real time environment.
CO2	To calculate the latency related issue easily.
CO3	Troubleshoot the security issues of computer networks.
CO4	To configure and debug various routing algorithms.
CO5	Familiarize the student with the taxonomy and terminology of the computer networking area.

Paper Name: BITDSC402 Paper Code: Software Engineering

со	Description: After the completion of the course student will be able
CO1	Demonstrate knowledge of the wider software engineering context, software engineering processes and their applicability.
CO2	Understand a problem domain and to elicit, analyze, and specify the requirements of a software system solution.
CO3	Describe and formulate test cases to perform different levels of testing
CO4	Identify and outline specific components of a software design that can be targeted for reuse.
CO5	Use the Agile process to develop a quality software product.
CO6	Analyze the engineering problems encountered in system and software development

Paper Name: Software Engineering Lab Paper Code: BITDSC492

со	Description: After the completion of the course student will be able
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CO1	Demonstrate knowledge of the wider software engineering context, software engineering processes and their applicability.
CO2	Understand a problem domain and to elicit, analyze, and specify the requirements of a software system solution.
CO3	Describe and formulate test cases to perform different levels of testing.
CO4	Identify and outline specific components of a software design that can be targeted for reuse.
CO5	Use the Agile process to develop a quality software product.
CO6	Analyze the engineering problems encountered in system and software development.

Paper Name: Machine Learning for Data Science Paper Code: BITDSC403

со	Description: After the completion of the course student will be able
CO1	To implement data science through machine learning.

CO2	Use deep learning is a part of machine learning in the Data Science Code implementation and many more.
	Code implementation and many more.

Paper Name: Internet of Things Paper Code: BITDSC501

со	Description: After the completion of the course student will be able
CO1	Interpret the impact and challenges posed by IoT networks leading to new architectural models.
CO2	Illustrate the smart objects and the technologies to connect them to the network.
CO3	Compare different Application protocols for IoT.
CO4	Infer the role of Data Analytics and Security in IoT.
CO5	Identify sensor technologies for sensing real world entities and understand the role of IoT in various domains

Paper Name: Internet of Things Lab Paper Code: BITDSC591

СО	Description: After the completion of the course student will be able
CO1	Can use devices like Raspberry PIInterfaces, Gateways and Data Management in IoT.
CO2	Able to build architecture in IoT

Paper Name: Artificial Intelligence Paper Code: BITDSC502

СО	Description: After the completion of the course student will be able
CO1	Define the fundamentals of digital image processing terminologies and features of images
CO2	Relate the mathematical foundations with image transformation, enhancement, segmentation and analysis
CO3	Implement algorithms on enhancement and restoration on image data
CO4	Measure performance of image processing algorithms in providing solutions to real life problems

CO5	Build image processing systems to solve real world problems of image processing
CO6	Design solutions for various applications in different subject domains

Paper Name: Artificial Intelligence Lab Paper Code: BITDSC592

со	Description: After the completion of the course student will be able
CO1	Apply good programming skills to formulate the solutions for computational problems.
CO2	Design and develop solutions for informed and uninformed search problems in AI
CO3	Utilize advanced packages like NLTK for implementing artificial intelligence.
CO4	Demonstrate and enrich knowledge to select and apply AI tools to synthesize information and develop models within constraints of application area

CO5	Develop a minor project in multidisciplinary areas to demonstrate team work through reports and presentation.
CO6	Design and develop an Expert System that operates in a realistic problem domain and communicate effectively in a team or individual and prepare reports.

Paper Name: Cloud Computing Paper Code: BITDSC601

со	Description: After the completion of the course student will be able
CO1	To explore the working of open source and commercial cloud computing platforms
CO2	Selection of a particular deployment model according to scenario.
CO3	To be able to implement various services on the cloud.

CO4	Design and develop cloud using various cloud platforms.
CO5	Explore the usage of cloud simulation tools and techniques
CO6	Compare and contrast various open and commercial cloud platforms.

Paper Name: Cloud Computing Lab Paper Code: BITDSC691

СО	Description: After the completion of the course student will be able
CO1	Understand the hardware necessary for cloud computing and how components fit together.
CO2	Understanding the systems, protocols and mechanisms to support cloud computing and develop applications for cloud computing.
CO3	Determine numerous opportunities exist for practitioners seeking to create solutions for cloud computing.

Paper Name: Computer Vision & Image Processing Paper Code: BITDSC602

со	Description: After the completion of the course student will be able
CO1	Identify basic concepts, terminology, theories, models and methods in the field of computer vision,
CO2	Describe known principles of human visual system, describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition
CO3	Suggest a design of a computer vision system for a specific problem
CO4	Able to design and develop simple systems oriented to real-world computer vision applications such as those requiring segmentation and classification of objects in digital images.
CO5	Masters the basic algorithms, tools and systems for the management, processing and analysis of digital images.

Paper Name: Computer Vision & Image Processing Lab Paper Code: BITDSC692

со	Description: After the completion of the course student will be able

CO1	Implement algorithms on enhancement and restoration on image data
CO2	Measure performance of image processing algorithms in providing solutions to real life problems
CO3	Build image processing systems to solve real world problems of image processing
CO4	Design solutions for various applications in different subject domains

Programme Name: M.Tech in Internet of Things Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MTECHITIOT/AllSem20.pdf

Paper Name: Mathematical foundations of Computer Science Paper Code: PGIT(IoT)101

СО	Description: After the completion of the course student will be able
CO1	Ability to apply mathematical logic to solve problems
CO2	Understand sets, relations, functions, and discrete structures.
CO3	Able to use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, and functions
CO4	Able to formulate problems and solve recurrence relations.
CO5	Apply the concept of two dimensional random variables to correlation, regression and Central limit theorem
CO6	Able to model and solve real-world problems using graphs and trees.

Paper Name: Advanced Data Structure Paper Code: PGIT(IoT)102

со	Description: After the completion of the course student will be able
CO1	Summarize the concept of data structure, data type and array data structure
CO2	Implement linked list data structure to solve various problems.
CO3	Apply various data structures such as stacks, queues, trees and graphs to solve various computing problems using C-programming language.
CO4	Compare the standard algorithms for searching and sorting
CO5	Evaluate the performance of an algorithm in terms of complexity using asymptotic notation.
CO6	Choose effectively the data structure that efficiently model the information in a problem

Paper Name: Research Methodology and IP Paper Code: PGIT(IoT)105

СО	Description: After the completion of the course student will be able
CO1	Understand research problem formulation.
CO2	Analyze research related information
CO3	Follow research ethics
CO4	Understand that today's world is controlled by Computer, Information Technology, but tomorrow's world will be ruled by ideas, concepts, and creativity.
CO5	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular
CO6	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits

Paper Name: English for research paper writing Paper Code: PGIT(IoT)106A

СО	Description: After the completion of the course student will be able
CO1	Understand that how to improve your writing skills and level of readability
CO2	Learn about what to write in each section
CO3	Understand the skills needed when writing a Title Ensure the good quality of paper at very first time submission

Paper Name: Disaster management Paper Code: PGIT(IoT)106B

со	Description: After the completion of the course student will be able
CO1	learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO2	critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives
CO3	develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

CO4	critically understand the strengths and weaknesses of disaster
	management approaches, planning and programming in different
	countries, particularly their home country or the countries they work in

Paper Name: Sanskrit for technical knowledge Paper Code: PGIT(IoT)106C

СО	Description: After the completion of the course student will be able
CO1	To get a working knowledge in illustrious Sanskrit, the scientific language in the world
CO2	Learning of Sanskrit to improve brain functioning
CO3	Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
CO4	The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Paper Name: Value education Paper Code: PGIT(IoT)106D

со	Description: After the completion of the course student will be able
CO1	Understand value of education and self- development
CO2	Imbibe good values in students
CO3	Let the should know about the importance of character

Paper Name: Advanced Data Structure Lab Paper Code: PGIT(IoT)192

со	Description: After the completion of the course student will be able
CO1	Represent data for efficient processing using the fundamental concept of Data Structure.
CO2	Develop applications using the search algorithms and sorting algorithms based on their time complexities.
CO3	Develop applications using the concepts of linear data structure like stack, queue and Linked List for different requirements.

CO4	Implement non-linear data structures like trees and graphs.
CO5	Design the application using the data structure that efficiently model the information in a problem

Paper Name: Advanced Computer Architecture Paper Code: PGIT(IoT)201

со	Description: After the completion of the course student will be able
CO1	Understand basic structure of digital computer, instruction set, number system, and arithmetic operations.
CO2	Learn the basic structure of stored program concepts and different arithmetic and control unit operations.
CO3	Become skilled at memory hierarchy and mapping techniques.
CO4	Study the techniques that computers use to communicate with peripheral devices.
CO5	Understand parallel architecture, pipelines, and interconnection networks.

CO6	Design the non Von-Neumann architectures.
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Paper Name: Wireless and Sensor Networks Paper Code: PGIT(IoT)202

со	Description: After the completion of the course student will be able
CO1	Identify different issues in wireless ad hoc and sensor networks.
CO2	To analyze protocols developed for ad hoc and sensor networks.
CO3	To identify and address the security threats in ad hoc and sensor networks.
CO4	Establish a Sensor network environment for different types of applications.

Paper Name: Constitution of India Paper Code: PGIT(IoT)205A
со	Description: After the completion of the course student will be able
CO1	Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective
CO2	To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
CO3	To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Paper Name: Pedagogy Studies Paper Code: PGIT(IoT)205B

со	Description: After the completion of the course student will be able
CO1	Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
CO2	Identify critical evidence gaps to guide the development.

Paper Name: Stress management by Yoga Paper Code: PGIT(IoT)205C

со	Description: After the completion of the course student will be able
CO1	To achieve overall health of body and mind
CO2	To overcome stress

Paper Name: Personality development through life enlightenment skills Paper Code: PGIT(IoT)205D

со	Description: After the completion of the course student will be able
CO1	To learn to achieve the highest goal happily
CO2	To become a person with stable mind, pleasing personality and determination
CO3	To awaken wisdom in students

Paper Name: Advanced Computer Architecture Lab Paper Code: PGIT(IoT)291

со	Description: After the completion of the course student will be able
CO1	To make students know about the Parallelism concepts in Programming
CO2	To give the students an elaborate idea about the different memory systems and buses
CO3	To introduce the advanced processor architectures to the students.
CO4	To make the students know about the importance of multiprocessors and multicomputers.
CO5	To study about data flow computer architectures

Paper Name: Wireless and Sensor Networks Lab Paper Code: PGIT(IoT)292

СО	Description: After the completion of the course student will be able
CO1	Describe the overview of wireless sensor networks and enabling technologies for wireless sensor networks
CO2	Understand the architectures, operating systems, execution environments and network architecture gateway concepts.
CO3	Explore the networking sensors physical layer and transceiver design considerations assignment of MAC addresses.
CO4	Understand the infrastructure establishment, topology control and joint routing and information aggregation.
CO5	Understand the sensor network platform and tools state-centric programming.

Programme Name: M. Tech in Software Engineering Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MTECHSE/AllSem.pdf

Paper Name: Mathematical Foundation of Computer Science Paper Code: PGSE-101

СО	Description: After the completion of the course student will be able
CO1	To understand the basic notions of discrete and continuous probability.
CO2	To understand the methods of statistical inference, and the role that sampling distributions play in those methods.
CO3	To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.

Paper Name: Advanced Data Structure Paper Code: PGSE-102

со	Description: After the completion of the course student will be able
CO1	Understand the implementation of symbol tables using hashing techniques.
CO2	Develop and analyze algorithms for red-black trees, B-trees and Splay trees.

CO3	Develop algorithms for text processing applications.
CO4	Identify suitable data structures and develop algorithms for computational geometry problems.

Paper Name: Research Methodology and IPR Paper Code: PGSE-105

со	Description: After the completion of the course student will be able
CO1	Select research problem formulation.
CO2	Explain research related information.
CO3	Describe research ethics.
CO4	Demonstrate the importance of computers in Bioinformatics.
CO5	Review the patent rights and licensing process.

CO6	Infer advanced IPR concept.

Paper Name: English for Research Paper Writing Paper Code: Audit Course I(A)

со	Description: After the completion of the course student will be able
CO1	Understand that how to improve your writing skills and level of readability
CO2	Learn about what to write in each section
CO3	Understand the skills needed when writing a Title Ensure the good quality of paper at very first time submission

Paper Name: DISASTER MANAGEMENT Paper Code: Audit Course I(B)

СО	Description: After the completion of the course student will
	be able

CO1	learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO2	critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives
CO3	develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO4	critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Paper Name: SANSKRIT FOR TECHNICAL KNOWLEDGE Paper Code: Audit Course I(C)

со	Description: After the completion of the course student will be able
CO1	Understanding basic Sanskrit language
CO2	Ancient Sanskrit literature about science & technology can be understood
CO3	Being a logical language will help to develop logic in students

Paper Name: VALUE EDUCATION Paper Code: Audit Course I(D)

со	Description: After the completion of the course student will be able
CO1	Knowledge of self-development
CO2	Learn the importance of Human values
CO3	Developing the overall personality

Paper Name: CONSTITUTION OF INDIA Paper Code: Audit Course I(E)

со	Description: After the completion of the course student will be able
CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

CO3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
CO4	Discuss the passage of the Hindu Code Bill of 1956.

Paper Name: PEDAGOGY STUDIES Paper Code: Audit Course I(F)

СО	Description: After the completion of the course student will be able
CO1	What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
CO2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
CO3	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Paper Name: STRESS MANAGEMENT BY YOGA Paper Code: Audit Course I(G)

со	Description: After the completion of the course student will be able
CO1	Develop healthy mind in a healthy body thus improving social health also
CO2	Improve efficiency

Paper Name: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS Paper Code: Audit Course I(H)

со	Description: After the completion of the course student will be able
CO1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
CO2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity
CO3	Study of Neetishatakam will help in developing the versatile personality of students.

Paper Name: Advanced Data Structures Paper Code: PGSE-191

со	Description: After the completion of the course student will be able
CO1	The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem
CO2	Students should be able to understand the necessary mathematical abstraction to solve problems.
CO3	To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
CO4	Students should be able to come up with analysis of efficiency and proof of correctness.

Paper Name: Advances in Algorithms Paper Code: PGSE-201

со	Description: After the completion of the course student will be able
CO1	Analyze the complexity/performance of different algorithms.

CO2	Determine the appropriate data structure for solving a particular set of problems.
CO3	Categorize different problems in various classes according to their complexity and know how to approach towards computationally hard problems

Paper Name: Software Quality Management Paper Code: PGSE-202

СО	Description: After the completion of the course student will be able
CO1	Utilize the concepts in software development life cycle.
CO2	Demonstrate their capability to adopt quality standards.
CO3	Assess the quality of software products.
CO4	Apply the concepts in preparing the quality plan & documents.

Paper Name: Advances in Algorithms Paper Code: PGSE-292

СО	Description: After the completion of the course student will be able		
CO1	Analyze a variety of algorithms with practical applications and the resource requirements of each.		
CO2	Determine the most suitable algorithm for any given task and then apply it to the problem.		
CO3	Demonstrate adequate comprehension of the theory of intractability and prove when certain kinds of problems are intractable.		

Programme Name: MASTER OF SCIENCE IN MATERIALS SCIENCE Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MSCMS/AllSem21.pdf

Paper Name: FUNDAMENTALS OF MATERIALS SCIENCE Paper Code: MMS101

СО	Description: After the completion of the course student will be able
CO1	Define and classify different types of materials such as metals, ceramics polymers and their composites based on their properties
CO2	Describe the general methods for the synthesis of different types of materials along with their properties and applications.
CO3	Select the appropriate material or material combination for developing new materials that would be required for specific/ customized applications
CO4	Develop and conduct appropriate experimentation, analyze and interpret data, and tailor the properties of targeted material through processing

Paper Name: Physics and Chemistry of Solids Paper Code: MMS102

со	Description: After the completion of the course student will
	be able

CO1	Understand the basic concepts of chemical bonding and diffusion in solids		
CO2	Achieve their basic knowledge about the electrical and magnetic properties of materials		
CO3	Acquire knowledge about transport phenomena related to momentum and energy		
CO4	Apply their acquired knowledge to create new materials		

Paper Name: Mechanics and Thermodynamics Paper Code: MMS103

со	Description: After the completion of the course student will be able
CO1	Conceptualize the fundamentals of classical and quantum mechanics
CO2	Understand the concepts of Laws of Thermodynamics and its different applications in materials designing
CO3	Understand the basic concepts of equipartition function, semiconductor statistics

CO4	Correlate functional	the appli	quantisation cations	towards	the	material	aspect	for

Paper Name: English for Scientific and Technical Writing Paper Code: MMS105

со	Description: After the completion of the course student will be able
CO1	A student will be able to communicate his / her understanding / ideas with others in written and verbal form
CO2	Students will be trained to develop their soft skills and self- development abilities
CO3	Develop presentation skill, introduce novelty in project based core courses
CO4	Evaluate the title writing and result writing skills

Paper Name: Computer Programming with Python & C for Materials Science Paper Code: MMS 191

со	Description: After the completion of the course student will be able
CO1	Understand different operating systems of the computer
CO2	Understand & Apply computer language like C and Python to solve problems of Materials Science
CO3	Write programs using Python with the help of various functions, syntax
CO4	Plan to solve the materials specific problems using Python libraries

Paper Name: Fundamental of Materials Science Lab Paper Code: MMS 192

со	Description: After the completion of the course student will be able	
CO1	Understand different classification of materials practically	
CO2	Apply their knowledge of materials to analyze the properties of materials used in everyday life	

CO3	Plan to characterize the materials properties using characterization techniques
CO4	Explain and correlate the structure-property of materials

Paper Name: Mechanical Behaviour of Materials Paper Code: MMS201

со	Description: After the completion of the course student will be able
CO1	Understand the mechanical properties of materials from a fundamental physics perspective using appropriate mechanical testing instruments.
CO2	Design and select materials based on the principles of fracture mechanics for desired applications
CO3	Formulate different failure of materials and suggest ways to strengthen their mechanical properties
CO4	Understand plastic deformation of materials along with understanding of elasticity, viscoelasticity and macroscopic deformation mechanism.

Paper Name: Structure and Imperfections in Solids Paper Code: MMS202

СО	Description: After the completion of the course student will be able
CO1	To develop the fundamental on structure of material, crystal, bravis lattice and defining parameters
CO2	Develop the informatics on matter and void and perturbation by any external/internal means. Study on defect matrix and its influence
CO3	Apply the knowledge of defect orientation and method on system and functionalise functional materials

Paper Name: Synthesis and Characterization of Materials Paper Code: MMS203

со	Description: After the completion of the course student will be able
CO1	Develop the initial insight on the synthesis aspect of materials, influence of synthesis technique on structure property relation
CO2	To identify the area of a material required to be analyzed in terms of morphological, mechanical, thermal, electrical, bulk properties etc
CO3	Apply the knowledge of synthesis and characterization for optimization of new materials.

CO4 Design application specific material, h	nybrid and smart materials
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Paper Name: Research Methodology & IPR Paper Code: MMS 205

со	Description: After the completion of the course student will be able
CO1	Search the literatures, define a research problem and capable of designing a research plan to solve the desired problem
CO2	Apply different software tools for computer programming to design new materials modeling
CO3	Able to analyze the data obtained from experimental work

Paper Name: Materials Synthesis and Characterizations Lab Paper Code: MMS 291

со	Description: After the completion of the course student will be able
CO1	Understand and discuss the basic principles of advanced characterization techniques

CO2	Explain and correlate the structure-property of materials at the nanoscale by different characterization techniques
CO3	Apply and select appropriate techniques for characterizing specific chemical and physical properties of materials
CO4	Demonstrate the basic aspects of advanced materials and their applications, such as electronic materials, optical materials, magnetic materials, biomaterials

Paper Name: Computational Materials Science Lab Paper Code: MMS 292

СО	Description: After the completion of the course student will be able
CO1	Understand analytical, developmental and technical principles that relate to Numerical Linear Algebra
CO2	Understand & Apply Numerical Methods for solving Differential Equations, and Numerical Optimization to solve problems of Materials Science
CO3	Write small programs using Python using its functions which will help to demonstrate an ability to initiate and sustain research in Numerical Analysis or Numerical Optimization

Paper Name: Optical, Electronic & Magnetic Behaviour of Materials Paper Code: MMS301

СО	Description: After the completion of the course student will be able
CO1	Introduce the concept of Wave equation, electromagnetic wave and its correlation with optical and electrical properties of material
CO2	Understanding the basics of optical and electronic property and the correlated device application
CO3	Understanding the basics of electron domain and classification of magnetism
CO4	Device application of electronic, optical and magnetic properties of matter and structure-property correlation.

Paper Name: Nanomaterials: Principles and Applications Paper Code: MMS302

СО	Description: After the completion of the course student will be able
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CO1	Introduce the concept of nanomaterials and associated changes in their properties from bulk
CO2	Familiarize with various top down and bottom-up methods for synthesis of nanomaterials.
CO3	Explain the properties and applications of some recently developed nanostructures

Paper Name: Applications of Artificial Intelligence and Machine Learning in Materials Science Paper Code: MMS304

СО	Description: After the completion of the course student will be able
CO1	A detailed basic knowledge on artificial intelligence and machine learning
CO2	Explain the operation of AI/ML to real life problems, different architectures.
CO3	Application of AI/ML in material science, case studies and optimizing the structure property relation with new functional class.

Paper Name: Optical, Electronic & Magnetic Properties of Materials Lab Paper Code: MMS 391

со	Description: After the completion of the course student will be able
CO1	Understand different classification of materials and their behavior
CO2	Plan experiment for analyzing the different materials behavior like electrical, mechanical, optical and electronic
CO3	Study the materials behavior under different factors

Paper Name: Business Economics and Entrepreneurship Paper Code: MMS 381

СО	Description: After the completion of the course student will be able
CO1	Understand basics of business studies
CO2	Plan and write report on business and entrepreneurship results
CO3	Understand IPRs and institutional support in entrepreneurship, Case Study of Entrepreneurs.

Programme Name: MASTER OF TECHNOLOGY IN MATERIALS SCIENCE & TECHNOLOGY

Syllabus link: http://makautexam.net/aicte_details/Syllabusl/MTECHMS/AllSem.pdf

Paper Name: Introduction to Materials Science and Technology Paper Code: MST101

со	Description: After the completion of the course student will be able
CO1	Analyze the structure of materials at micro to macro level
CO2	Extract the knowledge related to crystal systems and their imperfections
CO3	Explain the concept of phase & phase diagram
CO4	Classify different types of materials with their properties
CO5	Understand Fick's law of diffusion and can correlate it with materials structurization

Paper Name: Mechanical Behavior of Materials Paper Code: MST102

со	Description: After the completion of the course student will be able
CO1	Explain the importance of mechanical properties of materials and their industrial application for engineering design in the Materials Science and Engineering field.
CO2	Evaluate mechanical behavior, measurements of mechanical properties and test methods.
CO3	Demonstrate the improvements of strength and toughness of materials.
CO4	Define thermal behavior and high temperature applications of materials.

Paper Name: Electronic, Optical and Magnetic Properties of Materials Paper Code: MST103

со	Description: After the completion of the course student will be able
CO1	Demonstrate understanding of the electrical properties of materials and applications of these properties in fabrication of modern devices.
CO2	Demonstrate an understanding of the magnetic properties of materials and their applications.

CO3	Explain the importance of optical properties of materials.
CO4	Learn a few basic and advanced properties of materials related to the advancement of materials.

Paper Name: Fundamental of Materials Processing Paper Code: MST104

со	Description: After the completion of the course student will be able
CO1	Gain the ability to relate processing to structure and performance pertaining to several different types of material.
CO2	Understand the interrelation of energy, environment and economics in materials processing and gain knowledge of advanced material processing research and development activities.
CO3	Develop the ability to apply existing processing principles to process new materials.

Paper Name: Research Methodology and IPR Paper Code: MLC101

со	Description: After the completion of the course student will be able
CO1	Develop the ability to apply the methods while working on a research project work
CO2	Choose the appropriate research design and develop appropriate research hypothesis for a research project
CO3	Develop advanced critical thinking skills
CO4	Develop skills in qualitative and quantitative data analysis and presentation

Paper Name: Characterization of Materials Paper Code: MST191

СО	Description: After the completion of the course student will be able
CO1	Understand and discuss the basic principles of advanced characterization techniques
CO2	<i>Explain</i> and <i>correlate</i> the structure-property of materials at the nanoscale by different characterization techniques

CO3	Apply and select appropriate techniques for characterizing specific chemical and physical properties of materials
CO4	Demonstrate the basic aspects of advanced materials and their applications, such as electronic materials, optical materials, magnetic materials, biomaterials

Paper Name: Nanostructures and Nanomaterials Paper Code: MST201

со	Description: After the completion of the course student will be able
CO1	Understand various forms of nanomaterials
CO2	Demonstrate different synthesis techniques of nanomaterials and their application
CO3	Correlate properties of nanostructures with their size, shape and surface characteristics.
CO4	Explain the environmental impact of nanostructured materials

Paper Name: Mathematics for Materials Science and Technology

со	Description: After the completion of the course student will be able
CO1	Formulate mathematical problems and identify the correct numerical methods for solving them
CO2	Familiar with the mathematical ability to design and conduct experiments, interpret and analyze data, and generate correlation of obtained results.
CO3	Interpret and solve problems related to the properties of materials and applications.
CO4	Develop modeling and computing skills

Paper Name: Synthesis, Fabrication and Processing of Materials Paper Code: MST291

со	Description: After the completion of the course student will be able
CO1	Understands the working principles of different advanced processes

CO2	<i>Synthesize</i> nanostructured materials by advanced processing methods
CO3	Perform experiments with best practices and understands the advantages and limitations of different processes
CO4	Recommend a suitable process for modifying the material properties

Paper Name: Material and Energy Balances Paper Code: MST301

СО	Description: After the completion of the course student will be able
CO1	Apply knowledge of basic science and engineering fundamentals to solve material and energy balances
CO2	Develop an explicit understanding about the importance of safety in process industries

CO3	Perform a degree-of-freedom analysis
CO4	Draw and label a process flow diagram from a written description of a process
CO5	Derive and solve the equations needed to solve for unknown process variables

Paper Name: Medical Biomaterials Paper Code: MST401

СО	Description: After the completion of the course student will be able
CO1	To understand the usage of biomaterials as metals, ceramics and polymers. Knowledge gathering on structure, properties and morphology.
CO2	To understand the method of categorization of biomaterials
CO3	Apply and analyze the methods to characterize interactions between materials, tissue and correlate with ailments.
CO4	Capable of explaining methods to repair and regenerate injured or lost functional tissue with materials

Programme Name: M.Sc. in IT (Data Science) Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MSCITDS/AllSem20.pdf

Paper Name: Advanced Statistics Paper Code: MITDS-101

СО	Description: After the completion of the course student will be able
CO1	Describe basic features of the data.
CO2	Summarize the sample using different quantitative measures.
CO3	Apply and compare various counting techniques to analyze a particular problem.
CO4	Identify different forms of probability distribution for discrete and continuous data.
CO5	Evaluate and compute the chance of an event.
CO6	Build predictive models for the sample data.

Paper Name: Advanced Data Structures and Algorithms Paper Code: MITDS-102

СО	Description: After the completion of the course student will be able
CO1	Develop programs using the concepts of pointers and dynamic memory allocation.
CO2	Describe Data structures and implement space and time complexity of the algorithms.
CO3	Describe different types of linked lists and develop programs using the C language. Construct stacks and queues using the concept of Arrays and Linked lists.

Paper Name: Introduction to Data Science Paper Code: MITDS-103

СО	Description: After the completion of the course student will be able
CO1	Having an ability to apply mathematics and science in AI and machine learning applications
CO2	Having computational thinking (Ability to translate vast data into abstract concepts and to understand database reasoning)
CO3	Having problem-solving ability- solving social issues and engineering problems
CO4	Having an ability to use techniques, skills and modern engineering tools necessary for engineering practice
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CO5	Having critical thinking and innovative skills

Paper Name: Data Visualization Paper Code: MITDS-104

со	Description: After the completion of the course student will be able
CO1	Understand the fundamental design principles and different types of data visualization
CO2	Understand the landscape of Python data visualization libraries
CO3	Create static and interactive charts using specialized Python libraries (for example Plotline, Plotly or Altair).
CO4	Understand how Cultures of Practice influence the way data may be collected, described, or formatted in order to align their own data management practices with those of their discipline.
CO5	How to manipulate the initial data using the well-known libraries NumPy and pandas, a general understanding of the seaborn library

Paper Name: Research Methodology and IPR

Paper Code: MITDS-105

со	Description: After the completion of the course student will be able
CO1	Identify and discuss the issues and concepts salient to the research process.
CO2	Identify and discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project.
CO3	Search for, select and critically analyzes research articles and papers
CO4	Formulate and evaluate research questions
CO5	Gain experience with instrument development and data collection methods
CO6	Gain experience with ethics proposals
CO7	Prepare a literature review and peer review

Paper Name: Advanced Data Structures and Algorithms Lab Paper Code: MITDS-192

со	Description: After the completion of the course student will be able
CO1	Develop programs in C language using Sorting techniques.
CO2	Develop programs in C language using Searching techniques
CO3	Use of Binary Trees and its Applications

Paper Name: Data Visualization Lab Paper Code: MITDS- 194

со	Description: After the completion of the course student will be able
CO1	Create static and interactive charts using specialized Python libraries (for example Plotline, Plotly or Altair).
CO2	Understand how Cultures of Practice influence the way data may be collected, described, or formatted in order to align their own data management practices with those of their discipline.

CO3	How to manipulate the initial data using the well-known libraries NumPy and pandas, a general understanding of the seaborn library

Paper Name: Big Data Analytics & Big Data Analytics Lab Paper Code: MITDS-201 & MITDS-291

СО	Description: After the completion of the course student will be able
CO1	Understand fundamentals of Big Data analytics.
CO2	Investigate Hadoop framework and Hadoop Distributed File system
CO3	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.
CO4	Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.
CO5	Use Machine Learning algorithms for real world big data.

Paper Name: Machine Learning & Machine Learning Lab Paper Code: MITDS-202 & MITDS-292

со	Description: After the completion of the course student will be able
CO1	Compare and contrast different paradigms for learning (supervised, unsupervised. Etc.)
CO2	Have an understanding of the strengths and weaknesses of many popular machine learning approaches.
CO3	Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
CO4	Be able to design and implement various machine learning algorithms in a range of real-world applications.
CO5	Learn the concepts in Bayesian analysis from probability models and methods.

Paper Name: Data Preparation and Analysis & Data Preparation and Analysis Lab Paper Code: MITDS–203 & MITDS-293

со	Description: After the completion of the course student will be able
CO1	Devise Python programs into functions with conditional and loops statements

CO2	Develop python-based applications using OOPs concepts and apply file I/O operations.
CO3	Apply string manipulation in python programs.
CO4	Analyze the data by aggregations and grouping operations.
CO5	Develop a python application with visualization effects.

Paper Name: CONSTITUTION OF INDIA

Paper Code: MITDS- 205A

СО	Description: After the completion of the course student will be able
CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

CO3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
CO4	Discuss the passage of the Hindu Code Bill of 1956.

Paper Name: PEDAGOGY STUDIES Paper Code: MITDS- 205B

СО	Description: After the completion of the course student will be able
CO1	What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
CO2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
CO3	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Paper Name: STRESS MANAGEMENT BY YOGA Paper Code: MITDS- 205C

СО	Description: After the completion of the course student will be able
CO1	Develop healthy mind in a healthy body thus improving social health also
CO2	Improve efficiency

Paper Name: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS Paper Code: MITDS- 205D

СО	Description: After the completion of the course student will be able
CO1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
CO2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity
CO3	Study of Neetishatakam will help in developing the versatile personality of students.

Paper Name: Deep Learning Paper Code: MITDS-301

со	Description: After the completion of the course student will be able
CO1	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
CO2	Implement deep learning algorithms and solve real-world problems
CO3	Understand the key notions of deep learning, such as neural networks, learning regimes, optimization algorithms and training methodologies.
CO4	Know how to effectively use python and pytorch to implement models and algorithms from the recent literature.
CO5	Perform a small research project using the studied notions and techniques.

Paper Name: Deep Learning Lab Paper Code: MITDS-391

СО	Description: After the completion of the course student will be able
CO1	Understand the cloud-based gaming, standard protocols and mechanisms to support Gaming.
CO2	Determine the suitability of cloud with gaming environment and hardware necessary for Gaming.
CO3	Develop applications based on animation.
CO4	Analyse numerous opportunities exist for practitioners seeking to create Mobile Gaming.

Programme Name: M. Tech in Artificial Intelligence Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MTECHITAI/AllSem.pdf

Paper Name: Mathematical foundations of Computer Science Paper Code: PGIT(AI)101

CO	Description: After the completion of the course student will be able
CO1	Apply mathematical and computing knowledge.
CO2	Problem solve through modeling of real world phenomena using mathematics and computing
CO3	Assess current technology and future trends in computer science.
CO4	Approach mathematics and computer science research questions from a perspective consistent with the norms of the field.
CO5	Communicate mathematical and computing knowledge

Paper Name: Advances in Artificial Intelligence Paper Code: PGIT(AI)102

со	Description: After the completion of the course student will be able
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CO1	Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations
CO2	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning
CO3	Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models
CO4	Demonstrate proficiency developing applications in an 'Al language', expert system shell, or data mining tools.
CO5	Demonstrate proficency in applying scientifc method to models of machine learning
CO6	Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications

Paper Name: Research Methodology and IPR Paper Code: PGIT(AI)105

CO Description: After the completion of the course student will be able

CO1	Understand the research problem and research process
CO2	Understand research ethics
CO3	Prepare a well-structured research paper and scientific presentations
CO4	Explore on various IPR components and process of filing
CO5	Understand the adequate knowledge on patent and rights

Paper Name: English for Research Paper Writing Paper Code: PGIT(AI)106A

со	Description: After the completion of the course student will be able
CO1	Understand that how to improve your writing skills and level of readability
CO2	Learn about what to write in each section

CO3	Understand the skills needed when writing a Title Ensure the
	good quality of paper at very first time submission

Paper Name: DISASTER MANAGEMENT Paper Code: PGIT(AI)106B

со	Description: After the completion of the course student will be able
CO1	learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO2	critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives
CO3	develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO4	critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Paper Name: SANSKRIT FOR TECHNICAL KNOWLEDGE Paper Code: PGIT(AI)106C

со	Description: After the completion of the course student will be able
CO1	Understanding basic Sanskrit language
CO2	Ancient Sanskrit literature about science & technology can be understood
CO3	Being a logical language will help to develop logic in students

Paper Name: VALUE EDUCATION Paper Code: PGIT(AI)106D

СО	Description: After the completion of the course student will be able
CO1	Knowledge of self-development
CO2	Learn the importance of Human values
CO3	Developing the overall personality

Paper Name: Artificial Intelligence Lab Paper Code: PGIT(AI)192

со	Description: After the completion of the course student will be able
CO1	Apply good programming skills to formulate the solutions for computational problems.
CO2	Design and develop solutions for informed and uninformed search problems in AI.
CO3	Utilize advanced packages like NLTK for implementing artificial intelligence.
CO4	Demonstrate and enrich knowledge to select and apply AI tools to synthesize information and develop models within constraints of application area
CO5	Develop a minor project in multidisciplinary areas to demonstrate team work through reports and presentation.
CO6	Design and develop an Expert System that operates in a realistic problem domain and communicate effectively in a team or individual and prepare reports.

Paper Name: Advanced Algorithm Paper Code: PGIT(AI)201

со	Description: After the completion of the course student will be able
CO1	Develop a sound theoretical understanding of advanced algorithms and practical problem solving skills.
CO2	Explore a wide range of advanced algorithm design techniques including dynamic programming, greedy methods, flow networks and approximation algorithms.
CO3	Analyze various complexity measures (e.g., running time, disk space) to compute the complexity/performance of different algorithms.
CO4	Investigate advanced issues related to design and analysis techniques of algorithms and their relation to NP-complete problems.
CO5	Determine the most suitable algorithm for any given task and then apply it to the given problem.

Paper Name: Artificial Neural Networks Paper Code: PGIT(AI)202

со	Description: After the completion of the course student will
	be able

CO1	Understand the difference between biological neuron and artificial neuron
CO2	Understand the application areas of neural networks
CO3	Understand building blocks of Neural Networks.
CO4	Develop neural network models
CO5	Design and develop applications using neural networks.

Paper Name: Constitution of India Paper Code: PGIT(AI)205A

со	Description: After the completion of the course student will be able
CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

CO3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
CO4	Discuss the passage of the Hindu Code Bill of 1956.

Paper Name: Pedagogy Studies Paper Code: PGIT(AI)205B

со	Description: After the completion of the course student will be able
CO1	What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
CO2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
CO3	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Paper Name: Stress management by Yoga Paper Code: PGIT(AI)205C

со	Description: After the completion of the course student will be able
CO1	Develop healthy mind in a healthy body thus improving social health also
CO2	Improve efficiency

Paper Name: Personality development through life enlightenment skills Paper Code: PGIT(AI)205D

со	Description: After the completion of the course student will be able
CO1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
CO2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity
CO3	Study of Neetishatakam will help in developing the versatile personality of students.

Paper Name: Artificial Neural Network Lab Paper Code: PGIT(AI)292

со	Description: After the completion of the course student will be able
CO1	superior for cognitive tasks and processing of sensorial data such as vision, image- and speech recognition, control, robotics, expert systems
CO2	design single and multi-layer feed-forward neural networks
CO3	Learn to design and build neural network models
CO4	Learn to develop learning algorithms for machine learning

Programme Name: MCA Syllabus link: http://makautexam.net/aicte_details/Syllabusl/MCA/yr1.pdf

Paper Name: Programming for problem solving Paper Code: MCAC101

СО	Description: After the completion of the course student will be able
CO1	Able to understand the basic knowledge of Computer fundamental and its application in computers.
CO2	Able to understand the basic concepts of C programming language.
CO3	Able to design and develop various programming problems using C programming concepts.
CO4	Able to Implement advance C programming concepts like function, pointer, structure and union etc.
CO5	Able to understand the file handling using C Programming language.

Paper Name: Programming for problem solving Lab Paper Code: MCAC191

со	Description: After the completion of the course student will be able
CO1	Understand and describe the structure of a C program to explain, write, compile and execute programs using input and output statements.
CO2	Classify and write programs by applying the decision control statements and loop control statements using different operators.
CO3	Formulate, analyze and solve the problem by writing programs using pointers, arrays and strings.
CO4	Design object based programs by creating new data types using structure and union.
CO5	Understand and use the concept of functions and file operations; moreover design new functions to solve module driven problems

Paper Name: COMPUTER NETWORKS Paper Code: MCAC102

со	Description: After the completion of the course student will be able
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CO1	Understand the basic concepts of data communication and networking
CO2	Analysis the different problems in the field of networking
CO3	Evaluate different solutions to the networking related problem.
CO4	Apply the knowledge of networking in development optimal solution

Paper Name: COMPUTER NETWORKS Lab Paper Code: MCAC192

СО	Description: After the completion of the course student will be able
CO1	Explain OSI Reference Model and in particular have a good knowledge of Layers 1-3
CO2	Working knowledge of datagram and internet socket programming
CO3	Design and test simple programs to implement networking concepts using Java.

CO4	Design simple data transmission using networking concepts and implement.
CO5	Compare and analyze different existing protocols.
CO6	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.

Paper Name: Discrete Structures Paper Code: MCAC103

со	Description: After the completion of the course student will be able
CO1	Study the concepts of relation, function, discrete numeric function, and algebraic structure.
CO2	Understand and develop the logical skills and study the concept of lattices.
CO3	Study the concepts of formal language.

CO4	Develop the concepts to construct finite automata with regular expression.
CO5	Develop the concepts to design the Turing/Pushdown automata machine.

Paper Name: Soft Skills Paper Code: MCAS101

со	Description: After the completion of the course student will be able
CO1	Develop the concept of communication and speaking skills.
CO2	Develop the ways to improve personality, soft skills and organizational skills.
CO3	Develop the thinking ability and expression improvement in group discussion.
CO4	Design the effective resume as per industry requirement.

Be ready for personal interviews through mock interviews and have knowledge of various interviews.

Syllabus link: http://makautexam.net/aicte_details/Syllabusl/MCA/yr1.pdf

Paper Name: Object Oriented Programming Paper Code: MCAC201

СО	Description: After the completion of the course student will be able
CO1	Able to understand the basic OMT notations of Object modeling and design object model of real world problems.
CO2	Able to understand the basic OMT notations of dynamic modeling and design state transition diagram of real world problems.
CO3	Able to understand the basic OMT notations of functional modeling and design data flow diagram of real world problems.
CO4	Able to use and implement the concepts of classes, objects, functions, inheritance and constructor using C++.
CO5	Able to use and implement the concepts of Pointer, Virtual function and Polymorphism using C++.

Paper Name: Object Oriented Programming Lab Paper Code: MCAC291

со	Description: After the completion of the course student will be able
CO1	Implement object oriented concepts such as objects, class abstraction and message passing.
CO2	Implement the friend function and function overloading.
CO3	Implement Operator overloading, Inheritance and method overriding.
CO4	Implement virtual functions to achieve Runtime polymorphism.
CO5	Implement the various functions on String.
CO6	Apply I/O operation to handle file systems.

Paper Name: Operating Systems Paper Code: MCAC202

СО	Description: After the completion of the course student will be able
CO1	Explain the types of operating system and ability to create threads and perform interposed communication.
CO2	Understand CPU scheduling and be able to solve process synchronization problems.
CO3	Understand issues surrounding deadlock handling and memory management.
CO4	Explain paging and segmentation methods suitable for virtual memory. Ability to manage files and directory.
CO5	Be able to recover and manage disk spaces. Knowledge of files systems and Android OS.

Paper Name: Operating Systems Lab Paper Code: MCAC292

СО	Description: After the completion of the course student will be able
CO1	Implement various CPU scheduling algorithms.

CO2	Implement various page replacement algorithms.
CO3	Explain the process of system call.
CO4	Apply the various file operations.
CO5	Implement various disk scheduling algorithms.
CO6	Implement various classical problems.

Paper Name: Database Management System Paper Code: MCAC203

СО	Description: After the completion of the course student will be able
CO1	Able to understand the basic concepts of DBMS and ER Model and How to draw ER Diagrams.

CO2	Ability to define constraints, writing queries using SQL syntax and Applying the Relational algebra and Calculus to define expressions for queries in Databases.
CO3	Able to understand the purpose of Normalization and defining various Normal forms.
CO4	Able to understand the basic issues while implementing the concept of Transaction and recovery.
CO5	Able to understand the various Concurrency Control techniques and concepts of Object Oriented databases.

Paper Name: Database Management System Lab Paper Code: MCAC293

со	Description: After the completion of the course student will be able
CO1	Illustrate the basic DDL commands
CO2	Illustrate DCL and DML commands.

CO3	Demonstrate SQL queries using SQL operators.
CO4	Explain the concept of relational algebra.
CO5	Implement various queries using date and group functions and elaborate nested queries.
CO6	Construct views, cursor and triggers.

Paper Name: Web Design and Development Paper Code: MCAS294

СО	Description: After the completion of the course student will be able
CO1	Describe the concepts of the World Wide Web, and the requirements of effective web design.
CO2	Develop web pages using the HTML and CSS features with different layouts as per need of applications.
CO3	Use JavaScript to develop dynamic web pages.

CO4	Construct a simple web page and to represent data in XML format.
CO5	Use server side scripting with PHP/Python to generate the web pages dynamically using the database connectivity.

Syllabus link: http://makautexam.net/aicte_details/Syllabusl/MCA/yr2.pdf

Paper Name: Analysis of algorithm Paper Code: MCAC301

СО	Description: After the completion of the course student will be able
CO1	Understand the algorithms and notation, including order notation, and how to analyze the complexity of the algorithms.
CO2	Understand the concept of Hashing, B-tree, and Red black tree and disjoint data structure.
CO3	Compare, contrast, and apply the key algorithmic design paradigms: divide and conquer, greedy method, dynamic programming techniques.
CO4	Understand the concepts of Graph algorithms to solve problems using Greedy methods as well as dynamic programming techniques.

CO5	To understand the concepts of Randomized, and exact vs. approximate. Implement, empirically compare, and apply fundamental algorithms and string matching, P, NP and NP complete real-world problems.
	complete real-world problems.

Paper Name: Management Information System Paper Code: MCAC302

со	Description: After the completion of the course student will be able
CO1	Understand and apply the fundamental concepts of information systems.
CO2	Develop the knowledge about management of information systems.
CO3	Interpret and recommend the use of information technology to solve business problems.
CO4	Apply a framework and process for aligning organization's IT objectives with business strategy

Paper Name: Software Engineering Paper Code: MCAC303

СО	Description: After the completion of the course student will be able
CO1	Learn the concepts of software crisis, issues, characteristics, evolution and application with respect to software engineering.
CO2	Know the fundamental aspects of software development with respect to requirement engineering, requirement analysis, design, coding, testing and maintenance.
CO3	Elaborate the implementation of life cycle and models used in software development.
CO4	Gain practical knowledge of software designing along with object oriented design approach and its methodology.
CO5	Find the practical implementation of software coding style and software testing strategies for software development.
CO6	Know the practical knowledge in software development in terms of maintenance of software after software implementation.
C07	Enhance the knowledge of management of software projects from initial stage to final stage for software development.

CO8	Access the practical knowledge for ensuring the quality and reliability of software during software development using models
	reliability of software during software development using models.

Paper Name: Software Engineering Lab Paper Code: MCAC393

со	Description: After the completion of the course student will be able
CO1	Solve the problems using Software Engineering techniques and Approaches
CO2	Apply various Software testing Techniques to find bugs in software.
CO3	Use open source software Engineering Tools.
CO4	Apply various Software Quality Assurance Techniques to ensure the quality in software.
Syllabus link: http://makautexam.net/aicte_details/Syllabusl/MCA/yr2.pdf

Paper Name: Research Methodology and IPR Paper Code: MCAC401

со	Description: After the completion of the course student will be able
CO1	Formulate research problems.
CO2	Analyze literature review and find research gaps to finalize research objectives.
CO3	Identify the need for ethics in research.
CO4	Identify the need of IPR for research projects for economic growth and social benefits.
CO5	Apply basic data analytics techniques: probability distribution, linear regression, ANOVA

Programme Name: M.Tech in Microelectronics & VLSI Technology Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MTECHMVLSI/AllSem.pdf

Paper Name: Advanced Engineering Mathematics Paper Code: PGMVD-101

СО	Description: After the completion of the course student will be able
CO1	Solve image processing & signal processing problems using different Integral transform techniques.
CO2	Solve Boundary value and Initial value problems.
CO3	To formulate problems in graph theoretic terms such as using graph coloring and matching theory.
CO4	Apply statistical theories to solve engineering problems.
CO5	Provide advanced knowledge on topics in pure mathematics, empowering the students to pursue higher degrees at reputed academic institutions.

Paper Name: Physics of VLSI Devices Paper Code: PGMVD-102

со	Description: After the completion of the course student will be able
CO1	Apply the knowledge of basic semiconductor material physics and analyze the characteristics of various electronic devices
CO2	To make the student conversant with the VLSI chip; In this context the importance of the Physics of the devices that make up the chip are to be highlighted.
CO3	The fundamental Physics of the Devices, with special emphasis on the MOSFET should be explained
CO4	The effects of scaling of device dimensions for inclusion in the VLSI chip are to be enumerated and analyzed.
CO5	Finally, the methods used to overcome the limitations in the context of the devices as they appear in the VLSI chip are to be included.

Paper Name: Data Structure and Algorithm Paper Code: PGMVD-103

со	Description: After the completion of the course student will be able
CO1	Recall the basics of data structure and describe the prerequisite of the data structure and algorithm.

CO2	Adapt and apply the knowledge of linear data structure, like array, linked list, stack and queue.
CO3	Adapt and apply the knowledge of non-linear data structure, like graph and tree.
CO4	Apply different types of the searching and sorting algorithms.

Paper Name: Microelectronics Technology & Microelectronics Lab-I (Fabrication Techniques) Paper Code: PGMVD-104 & PGMVD-191

СО	Description: After the completion of the course student will be able
CO1	appreciate the role of material Silicon in VLSI chips.
CO2	have a clear concept of the Unit Processes and their specific application area.
CO3	understand the fabrication of a complete device.
CO4	assess the different performance parameters of the unit process of a VLSI chip and comment on how to optimize the performance.

CO5	Understand the steps involved in nano device processing applied in the Semiconductor manufacturing industry.

Paper Name: Digital VLSI Circuit and Systems Paper Code: PGMVD-105

СО	Description: After the completion of the course student will be able
CO1	To learn the basics of Integrated Circuit (IC): different Domains of VLSI design, design automation tools and the state-of-the-art VLSI circuits.
CO2	To learn CMOS logic behavior, advantages and drawbacks using static, dynamic, Domino-logic and Bi-CMOS logic, logical effort, path effort, path effort delay, path parasitic delay, designing fast circuits and multistage logic networks and the concept of delay vs. fan out
CO3	To learn the basics of CMOS fabrication and Layout.
CO4	To learn EDA tools and their advantages, concept of test bench, simulation, design verification, synthesis and hardware description language (Verilog)

CO5	To learn the concept of Programmable Hardware and their requirements, FPGAarchitecture, configuration and design flow, concept of System on Chip (SOC) and FPGA as validation of custom design or ASIC, the design of a 32-bit RISC CPU, Static RAM and Simulation, Synthesis & validation of the architectures on FPGA and analysis their performances.

Paper Name: VLSI Design Lab-I Paper Code: PGMVD-192

СО	Description: After the completion of the course student will be able
CO1	To get familiar about VLSI Design Tools like Xilinx, Icarus Verilog, GTK Wave
CO2	To Understand the difference between sequential language and concurrent language.
CO3	To Know about the Hardware Description Language (Verilog/VHDL) to describe the Combinatorial and Sequential logic as well as Test Bench for simulation.
CO4	To Understand about the FPGA Board and JTAG Cable and generate bit stream file and download to the programmable hardware device: FPGA.

CO5	To get familiar with the front-end design tool: Synopsys and understand the hardware realization of the design by Synthesis
	Steps: High level Synthesis, logic Synthesis, physical Synthesis.

Paper Name: Analog VLSI Circuits & Systems Paper Code: PGMVD-201

со	Description: After the completion of the course student will be able
CO1	Learn circuit design technique and design issues in CMOS technologies.
CO2	Gain knowledge of basic MOS models, device capacitances, parasitic resistances, transconductance, up to frequency dependence of device parameters.
CO3	Understand the significance of different biasing styles and apply them for different circuits.
CO4	Design basic building blocks like sources, sinks, mirrors, up to layout level and acquire computer skills (e.g. LT-spice) for the design and analysis of circuits.
CO5	Comprehend the design and analysis of MOS Op-Amp circuits and systems, identifying suitable topologies of the constituent sub systems and corresponding circuits as per the specifications of the system.

Paper Name: Testing & Verification of VLSI Systems Paper Code: PGMVD-202

со	Description: After the completion of the course student will be able
CO1	To learn the step by step design flow of VLSI circuits and systems in details , the need of design verification & testing and the difference between testing and verification
CO2	To learn testing in different stages of manufacturing, Design verification, chip yield, system level operation and testing
CO3	To learn the concept of test vectors, test generation, different types of faults, fault modeling and to analyze the behavior of the circuit under test (CUT)
CO4	To learn different algorithms of Automatic Test generation (ATPG) on specific fault models and fault simulation, Design for Testability (DFT) and different approaches and also various techniques and methodologies used for testing different analog and mixed signal circuits.
CO5	To learn the concept of boundary scan technique and standardized test interface (IEEE standard 1149.1) to build capability of observing and controlling pins into each chip to make board test easier

Paper Name: Digital Signal Processing and Applications Paper Code: PGMVD-203

со	Description: After the completion of the course student will be able
CO1	To learn the concept of Discrete Signals/Digital signals & Systems and their advantages over Analog Signal Processing systems
CO2	To learn Continuous Time Fourier Transform (CTFT), Discrete Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT) , Fast Fourier Transform (FFT),
CO3	To learn the requisite mathematics (Z Transform) to model system behavior and their response to a given stimuli.
CO4	To learn and acquire design skills on frequency domain analysis of different filters such as FIR & IIR , multi-resolution filter and adaptive Filter using MATLAB
CO5	To learn in detail about time frequency analysis and Wavelet transform. And realization.
CO6	To learn the realization of Digital Filters on different hardware platforms (DSP Processors, FPGAs, advanced Signal Processors, FPGAs and ASICs.)
CO7	To learn different applications of Digital Signal Processing like DTMF, Echo cancellation , SDR etc.

Paper Name: Advanced Micro & Nano Devices Paper Code: PGMVD-204

со	Description: After the completion of the course student will be able
CO1	CO1-Develop and evaluate the fabrication and design of nanometric CMOS devices.
CO2	CO2- Explain the physical principles of spintronic devices, carbon nanotubes and graphene
CO3	CO3- Compare the properties of materials for deep-submicron and nanometre CMOS IC, HEMT, single electron transistors and resonant tunneling devices
CO4	CO4- Plan the fabrication procedure for deep-submicron and nanometre CMOS IC with the proper technological process for the materials of the substrate, implanted areas, isolation, metallisation.
CO5	CO5-Design simple CMOS integrated silicon MEMS sensor devices.

Paper Name: Micro Electronics Lab-II Paper Code: PGMVD-291

со	Description: After the completion of the course student will be able
CO1	Familiar with the capacitance-voltage characteristics and electrical parameters of the device under test.
CO2	Understand the design and Simulation of the circuit using Multisim software.
CO3	Familiar with the HMS3000 Hall Effect Measurement system and the determination of p-type/n-type semiconductor using the system.
CO4	Understand the capacitance or inductance curve of DUT by varying the frequency.
CO5	Familiar with the Surface treatment of silicon wafer.

Paper Name: VLSI Design Lab-II Paper Code: PGMVD-292

со	Description: After the completion of the course student will be able
CO1	Familiar with VLSI Tool like cadence virtuoso.

CO2	Design analog circuit using schematic editor window and also able to test the design.
CO3	Extract the Layout of analog circuits and CMOS circuits using Layout-XL.
CO4	Do transient, dc and ac analysis of the designed circuit using cadence virtuoso.
CO5	Understand the DRC check, LVS and RC Extraction.
CO6	Design circuits on LTSpice Tool and be able to test it.
CO7	Familiar with the LTSpice Tool.

Paper Name: Algorithms Paper Code: PGMVD301

со	Description: After the completion of the course student will be able
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CO1	Understand Different aspects of Algorithms: Complexity, Notations, Analysis.
CO2	Understand and apply graph minimization algorithms on VLSI net- lists in Structural Design.
CO3	Write code for algorithms used in computational and geometrical simplification and optimization using data structures for CAD tools.
CO4	Understand and write code for partitioning, floor planning, chip planning and pin assignment.
CO5	Understand different algorithms used for placement of cells during the physical design of a chip.
CO6	Understand and write code for algorithms used for routing of cells, clock and power supply.
C07	Apply optimization algorithms in various aspects of VLSI Design steps.

Programme Name: M. Sc in Microbiology Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MSCMB/AllSem.pdf

Paper Name: Biochemistry Paper Code: MSUMC-101

со	Description: After the completion of the course student will be able
CO1	Illustrate various biomolecular components
CO2	Relate metabolic pathways, enzyme catalysis, disease pathogenesis
CO3	AnalyzeLaboratory Technique & safety proteins, lipids, nucleic acid, saccharides structures and functional organizations,
CO4	Explain various biomolecular hierarchy, biochemical regulations and energetics
CO5	Determine structural formations and self-assembly systems for various pathological conditions from the perspective of biochemical reactions

Paper Name: Laboratory Technique & safety Paper Code: MSUMC-102

со	Description: After the completion of the course student will be able

CO1	Illustrate the basic understanding of laboratory safety and health hazard
CO2	Apply the theory of different chromatographic, electrophoretic and blotting techniques in the separation and purification and identification of macromolecules.
CO3	Explain the phenomena of radioactivity and its different application
CO4	Apply the centrifugation procedures to isolate and separate biological macromolecules.
CO5	Make use of microscopy and other advanced laboratory techniques

Paper Name: Cell & Molecular Biology Paper Code: MSUMC-103

СО	Description: After the completion of the course student will be able
CO1	Explain the structure and function of different intracellular organelles.
CO2	Build concept about Chromatin structure, DNA replication, transcription and protein synthesis

СОЗ	Demonstrate the mechanisms of protein trafficking at different cellular compartments.
CO4	Explain the regulatory mechanisms that control cellular reproduction and cell death.
CO5	Analyze the structure of the isolated cells and further manipulation on cells
CO6	Demonstrate the genome instability as well as cellular transformation
CO7	Explain the basics of Mendelian Genetics and Inheritance pattern based of extension to the Mendelian genetics

Paper Name: Biostatistics Paper Code: MSUMC-104

со	Description: After the completion of the course student will be able
CO1	Demonstrate the basic sampling procedure, data collection and presentations.
CO2	Apply the theory of variability measurement, Correlation and regression.

CO3	Analyze the data related to significance of a test, probability and distributions, and Computer oriented statistical techniques.

Paper Name: General Microbiology Paper Code: MSUMC-105

со	Description: After the completion of the course student will be able
CO1	Explain the microbial morphology, growth, culture method and genetics of bacteria, antimicrobial resistance and different methods of gene transfer.
CO2	Apply the knowledge of microbial classification and metagenomics for identification of unculturable microbes
CO3	Demonstrate the importance of bacterial gene transfer, mutations and recombination.
CO4	Explain the various types of interaction of microbes with biotic and abiotic stress.
CO5	Explain host-pathogen interaction, ecological impacts of microbes, microbial communication system and microbial fuel cells.

Paper Name: Biochemistry & Analytical Techniques Paper Code: MSUMC-191

СО	Description: After the completion of the course student will be able
CO1	Demonstrate Spectroscopy
CO2	Apply buffer system
CO3	Analyze protein with gel electrophoresis
CO4	Estimate unknown concentration of protein
CO5	Estimate unknown DNA concentration

Paper Name: Microbiology Paper Code: MSUMC-192

со	Description: After the completion of the course student will be able
CO1	take part in preparation of medium for bacterial culture

CO2	take part in the maintenance of microbial culture
CO3	demonstrate staining of bacterial cell
CO4	compare the results of using various types of microscopic techniques
CO5	compare various biochemical tests for microbial identification.
CO6	determine minimum inhibitory concentration (MIC) and experimental procedure to isolate bacteria from environment

Paper Name: Data analysis by software Paper Code: MSUMC-193

со	Description: After the completion of the course student will be able
CO1	take part in data analysis by different software.
CO2	demonstrate mean, median, mode, standard deviation and standard error of a given data set.

CO3	take part in the preparation of different types of graphs from a given data set.
CO4	analyze the statistical significance of the experimental data.
CO5	apply Wilcoxon test with confidence interval of median, two and three way anova, and Kaplan-Meier survival analysis system

Paper Name: Agricultural & Soil Microbiology Paper Code: MSUMC-201

СО	Description: After the completion of the course student will be able
CO1	Explain the importance of soil microorganisms in soil formations, structure and texture.
CO2	Apply the knowledge of microbial nitrogen fixations for sustainable agricultural practices.
CO3	Demonstrate biofertilizers and biopesticides production to improve crop development.
CO4	Explain the effects of environmental factors on microorganisms, biological control of soil-borne microbial pathogens, and utilization of beneficial Microorganisms in sustainable agriculture.

Paper Name: Industrial Microbiology & Fermentation Technology Paper Code: MSUMC-202

со	Description: After the completion of the course student will be able
CO1	demonstrate industrially important microbes, recent developments in fermentation processes and various optimization strategies at fermenter level
CO2	explain the sterilization methods and principles of batch and continuous processes
CO3	build knowledge about designing of industrial strains and various media optimization strategies
CO4	classify different types of fermenters and various critical components of bioreactors
CO5	Outline about the production of fermented foods and beverages, antibiotics, vaccines and industrially important enzymes.

Paper Name: Immunology Paper Code: MSUMC-203

СО	Description: After the completion of the course student will be able
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CO1	Infer the fundamental concepts of Immunology
CO2	Identify the cellular and molecular basis of immune responsiveness.
CO3	Explain the immune system in cancer, tumor immunology, vaccination and immunotherapy
CO4	Develop immunological experiments to predict the nature of immune response against bacterial, viral infection and allergic reaction.
CO5	Analyze genetic links of diseases and therapeutic interventions used against immunological disorders and infections.

Paper Name: Genetic Engineering Paper Code: MSUMC-204

со	Description: After the completion of the course student will be able
CO1	Explain the applications of different tools for genetic engineering

CO2	Build concept about different types of vectors for gene cloning and expression
CO3	Apply different types of PCR techniques according to their application
CO4	Compare between different methods of cDNA analysis
CO5	Categorize gene silencing and genome editing technologies for the creation of transgenic plant and animal

Paper Name: Applied Bioinformatics Paper Code: MSUMC-205

СО	Description: After the completion of the course student will be able
CO1	Choose various bioinformatics software and databases to solve Sequence-alignment related problems
CO2	Interpret meaningful information from different databases, integrate and code for genetic sequences analysis
CO3	Examine accurate and comprehensive information about the structures and energies of biomacromolecules at an atomic level

CO4 Apply the biproteomics.	pioinformatics tools	to study	Transcriptomics	and
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Paper Name: Genetic engineering Lab Paper Code: MSUMC-291

СО	Description: After the completion of the course student will be able
CO1	Take part in Plasmid DNA isolation, DNA quantitation, gene transfer techniques and restriction enzyme digestion of plasmid DNA
CO2	Analyze polymerase chain reaction products using agarose gel electrophoresis
CO3	Explain competent cell preparation and transformation of E.coli with standard plasmids
CO4	Determine transformation efficiency, recombinant protein expression and inclusion body formation in E.coli
CO5	Estimate the purification of His-tagged plant protein using Ni-NTA columns

Paper Name: Immunology Lab Paper Code: MSUMC-292

со	Description: After the completion of the course student will be able
CO1	Experiment with immunological techniques with the laboratory animals and human blood samples
CO2	Experiment with immunological techniques such as immunoblotting, ELISA, immunodiffusion.
CO3	Experiment with mammalian cell culture system
CO4	Experiment with preparation of antigens, immunization and methods of blood collection.

Paper Name: Virology Paper Code: MSUMC-301

со	Description: After the completion of the course student will be able
CO1	Classify the virus nomenclature system and morphology
CO2	Demonstrate the cultivation and assay of viruses

CO3	Illustrate entry and replication process in different viruses.
CO4	Develop the knowledge of pathogenesis of human, plant and insect viruses.
CO5	Analyze the mechanism of immunodeficiency virus infection and antiviral agents.

Paper Name: Environmental Microbiology Paper Code: MSUMC-302

СО	Description: After the completion of the course student will be able
CO1	Outline the developments in the field of environmental microbiology with special emphasis on the role of microbes in mitigating environment pollution.
CO2	Explain the role of microbes in solid and liquid waste management, water treatment, food spoilage, and techniques of food preservation.
CO3	Apply the process development for biofuels, bioplastics, biosurfactants, and paper.
CO4	Compare between bioremediation and phytoremediation processes and their impact on the environment.

Paper Name: Medical Microbiology Paper Code: MSUMC-303

со	Description: After the completion of the course student will be able
CO1	explain different aspects of epidemiology and Normal microflora of humans.
CO2	demonstrate etiology, symptomatology, prevention and control of some important contagious bacterial and Protozoan diseases
CO3	build the concept of medical mycology and parasitology
CO4	Apply the concept of medical microbiology for hospital acquired infection control programs & biological waste management.

Paper Name: IPR, Biosafety & Bioethics Paper Code: MSUMC-304

со	Description: After the completion of the course student will be able
CO1	Students will be able to demonstrate awareness about Intellectual Property Rights (IPRs) to take measures to protect their ideas.

CO2	Students will able to apply the knowledge to make business strategies by taking account of IPR to protect the of products derived from biotechnology research and issues related to application and obtaining patents
CO3	Students will be able to illustrate the knowledge on biosafety and risk assessment of products derived from recombinant DNA research and environmental release of genetically modified organisms, national and international regulations
CO4	Students will be able to explain the regulatory affairs of Biotechnology research.
CO5	Students will be able to infer ethical aspects related to biological, biomedical, health care and biotechnology research

Paper Name: Applied Bioinformatics Lab Paper Code: MSUMC-391

со	Description: After the completion of the course student will be able
CO1	take part in Downloading macromolecular sequences from the NCBI database.
CO2	construct non-redundant database of sequences and data-set on the basis of the E-value

CO3	compare the local and global alignment of proteins and domain architecture (DA) across different proteins.
CO4	select repeats in proteins using Pfam and repeats left undetected by Pfam.
CO5	construct phylogenetic tree using PHYLIP

Paper Name: Fermentation technology lab Paper Code: MSUMC-392

СО	Description: After the completion of the course student will be able
CO1	take part in screening of industrially important microorganisms
CO2	analyze microbial growth kinetics of an industrially important microorganism
CO3	classify different types of bioreactors and various critical components of fermentors
CO4	measure the microbial production of industrially important bioproduct

Programme Name: M. Sc. in Genetics Syllabus link: http://makautexam.net/aicte_details/Syllabusl/MSCGE/AllSem1.pdf

Paper Name: Biochemistry Paper Code: MSUGN-101

со	Description: After the completion of the course student will be able
CO1	Illustrate various biomolecular components
CO2	Relate metabolic pathways, enzyme catalysis, disease pathogenesis
CO3	Analyze proteins, lipids, nucleic acid, saccharides structures and functional organizations
CO4	Explain various biomolecular hierarchy, biochemical regulations and energetics
CO5	Determine structural formations and self-assembly systems for various pathological conditions from the perspective of biochemical reactions

Paper Name: Laboratory Technique & Safety Paper Code: MSUGN-102

со	Description: After the completion of the course student will be able
CO1	Illustrate the basic understanding of laboratory safety and health hazard
CO2	Apply the theory of different chromatographic, electrophoretic and blotting techniques in the separation and purification and identification of macromolecules.
CO3	Explain the phenomena of radioactivity and its different application
CO4	Apply the centrifugation procedures to isolate and separate biological macromolecules.
CO5	Make use of microscopy and other advanced laboratory techniques

Paper Name: Cell & Molecular Biology Paper Code: MSUGN-103

СО	Description: After the completion of the course student will be able
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CO1	Explain the structure and function of different intracellular organelles.
CO2	Build concept about Chromatin structure, DNA replication, transcription and protein synthesis
CO3	Demonstrate the mechanisms of protein trafficking at different cellular compartments.
CO4	Explain the regulatory mechanisms that control the cellular reproduction and cell death.
CO5	Analyze the structure of the isolated cells and further manipulation on cells
CO6	Demonstrate the genome instability as well as cellular transformation
CO7	Explain the basics of Mendelian Genetics and Inheritance pattern based of extension to the Mendelian genetics

Paper Name: Biostatistics Paper Code: MSUGN-104

со	Description: After the completion of the course student will be able
CO1	Demonstrate the basic sampling procedure, data collection and presentations.
CO2	Apply the theory of variability measurement, Correlation and regression.
CO3	Analyze the data related to significance of a test, probability and distributions, and Computer oriented statistical techniques.

Paper Name: Basic Genetics Paper Code: MSUGN-105

СО	Description: After the completion of the course student will be able
CO1	Demonstrate the basic principle of inheritance
CO2	Differentiate the Non-mendelian inheritance pattern from Mendelian inheritance

CO3	Explain the Linkage, Recombination & Crossing Over
CO4	Explain the different types of chromosomal variations and the polyploidy genetics
CO5	Demonstrate the genetics of drosophila
CO6	Analyze the pedigree

Paper Name: Biochemistry & AnalyticalTechniques Paper Code: MSUGN-191

со	Description: After the completion of the course student will be able
CO1	Demonstrate Spectroscopy
CO2	Apply buffer system
CO3	Analyse protein with gel electrophoresis

CO4	Estimate unknown concentration of protein
CO5	Estimate unknown DNA concentration

Paper Name: Lab on Cytogenetics Paper Code: MSUGN-192

со	Description: After the completion of the course student will be able
CO1	Experiment with whole blood and lymphocyte culture system
CO2	Determine the different blood cells
CO3	Prepare the chromosomes for observation
CO4	Categorize the chromosome on the basis of their characteristics

Paper Name: Data analysis using software Paper Code: MSUGN-193

со	Description: After the completion of the course student will be able
CO1	Take part in data analysis by different software.
CO2	Demonstrate mean, median, mode, standard deviation and standard error of a given data set.
CO3	Take part in the preparation of different types of graphs from a given data set.
CO4	Analyze the statistical significance of the experimental data.
CO5	Apply Wilcoxon test with confidence interval of median, two and three way anova, and Kaplan-Meier survival analysis system

Paper Name: Evolutionary Biology and Population Genetics Paper Code: MSUGN-201

со	Description: After the completion of the course student will be able
CO1	Demonstrate the genetic constitution of a population
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CO2	Demonstrate the genetic determinants that shape population traits
CO3	Calculate the effect of inbreeding, mutation, migration and selection on allele and genotype frequencies
CO4	Explain the different mode of speciation and the evolutionary processes that causes speciation
CO5	Construct and analyze the phylogenetic tree using DNA sequences

Paper Name: Clinical Genetics Paper Code: MSUGN-202

со	Description: After the completion of the course student will be able
CO1	Discuss the history and classification of genetic disorders
CO2	Demonstrate the genetic basis of Mendelian and multifactorial disorders

CO3	Demonstrate the different techniques for prenatal and molecular diagnosis
CO4	Review targeted gene therapy and gene editing therapy
CO5	Explain the recent advances in personalized therapy and infer the importance of genetic make up in responding to the drugs
CO6	Demonstrate the ethical issues in gene testing and genetics

Paper Name: Immunology Paper Code: MSUGN-203

СО	Description: After the completion of the course student will be able
CO1	Infer the fundamental concepts of Immunology
CO2	Identify the cellular and molecular basis of immune responsiveness.

CO3	Explain the immune system in cancer, tumor immunology, vaccination and immunotherapy
CO4	Develop immunological experiments to predict the nature of immune response against bacterial, viral infection and allergic reaction.
CO5	Analyze genetic links of diseases and therapeutic interventions used against immunological disorder and infections.

Paper Name: Genetic Engineering Paper Code: MSUGN-204

СО	Description: After the completion of the course student will be able
CO1	Explain the applications of different tools for genetic engineering
CO2	Build concept about different types of vectors for gene cloning and expression
CO3	Apply different types of PCR techniques according to their application

CO4	Compare between different methods of cDNA analysis
CO5	Categorize gene silencing and genome editing technologies for the creation of transgenic plant and animal

Paper Name: Applied Bioinformatics Paper Code: MSUGN-205

СО	Description: After the completion of the course student will be able
CO1	Choose various bioinformatics software and databases to solve Sequence-alignment related problems
CO2	Interpret meaningful information from different databases, integrate and code for genetic sequences analysis
CO3	Examine accurate and comprehensive information about the structures and energies of biomacromolecules at an atomic level
CO4	Apply the bioinformatics tools to study Transcriptomics and proteomics.

Paper Name: Genetic Engineering Lab Paper Code: MSUGN-291

со	Description: After the completion of the course student will be able
CO1	Take part in Plasmid DNA isolation, DNA quantitation, gene transfer techniques and restriction enzyme digestion of plasmid DNA
CO2	Analyze polymerase chain reaction products using agarose gel electrophoresis
CO3	Explain competent cell preparation and transformation of <i>E.coli</i> with standard plasmids
CO4	Determine transformation efficiency, recombinant protein expression and inclusion body formation in <i>E.coli</i>
CO5	Estimate the purification of His-tagged plant protein using Ni-NTA columns

Paper Name: Immunology Lab Paper Code: MSUGN-292

со	Description: After the completion of the course student will be able
CO1	Experiment with immunological techniques with the laboratory animals and human blood samples

CO2	Experiment with immunological techniques such as immunoblotting, ELISA, immunodiffusion.
CO3	Experiment with mammalian cell culture system
CO4	Experiment with preparation of antigens, immunization and methods of blood collection.

Paper Name: Human Genetics and Genetic Counselling Paper Code: MSUGN-301

со	Description: After the completion of the course student will be able
CO1	Demonstrate the complications to the basic pedigree pattern and approach to the analysis of complex traits
CO2	Discuss the Meiotic and Non-Meiotic chromosomal abnormalities in human
CO3	Calculate the genetic mapping of Mendelian and non-Mendelian characters
CO4	Sketch the strategies for identification of disease genes and causal mutations

CO5	Demonstrate the importance of Genetic Counseling and apply the Counseling knowledge for serving the patients and society

Paper Name: Developmental Biology Paper Code: MSUGN-302

со	Description: After the completion of the course student will be able
CO1	Define the Principles of Embryology and its genetic approaches
CO2	Illustrate the approaches to the study of plant development
CO3	Interpret Genetic analysis of developmental pathways in model organisms
CO4	Explain the Molecular and cellular biology of fertilization and Illustrate Molecular reproductive genetics of human
CO5	Explain in vitro fertilization

Paper Name: Genomics & Proteomics Paper Code: MSUGN-303

со	Description: After the completion of the course student will be able
CO1	Demonstrate the basics of human genome and utility of genome browser for visualization of genomic data
CO2	Describe the epigenetic mechanisms of gene regulations and strategies for Epigenome analysis
CO3	Analyze the epigenome and metagenome sequencing data and
CO4	Demonstrate the basic aspect of protein structure and different techniques utilized for determination of amino acids and protein structures
CO5	Demonstrate the different methods and techniques employed in protein structure and interaction analysis

Paper Name: IPR, Biosafety & Bioethics Paper Code: MSUGN-304

со	Description: After the completion of the course student will be able

CO1	Demonstrate awareness about Intellectual Property Rights (IPRs) to take measures to protect their ideas.
CO2	Apply the knowledge to make business strategies by taking account of IPR to protect the of products derived from biotechnology research and issues related to application and obtaining patents
CO3	Illustrate the knowledge on biosafety and risk assessment of products derived from recombinant DNA research and environmental release of genetically modified organisms, national and international regulations
CO4	Explain the regulatory affairs of Biotechnology research.
CO5	Infer ethical aspects related to biological, biomedical, health care and biotechnology research

Paper Name: Lab on Applied Bioinformatics Lab Paper Code: MSUGN-391

СО	Description: After the completion of the course student will be able
CO1	Take part in Downloading macromolecular sequences from the NCBI database.
CO2	Construct non-redundant database of sequences and data-set on the basis of the E-value

CO3	Compare the local and global alignment of proteins and domain architecture (DA) across different proteins.
CO4	Select repeats in proteins using Pfam and repeats left undetected by Pfam.
CO5	Construct phylogenetic tree using PHYLIP

Paper Name: Lab on Molecular Genetics and Developmental Genetics Paper Code: MSUGN-392

со	Description: After the completion of the course student will be able
CO1	Demonstrate the isolation and quantification of DNA from blood
CO2	Identify the coding sequences and summarize the primer designing methods
CO3	Examine the amplification of the gene of interest

CO4	Experiment with the sequencing methods and analyze the DNA sequencing chromatogram
CO5	Design experiments to identify the molecular defects causing genetic diseases

Programme Name: B.Sc in Biotechnology Syllabus link: http://makautexam.net/aicte_details/SyllabusI/BSCBT/AllSem20.pdf

Paper Name: Biochemistry and Metabolism Paper Code: BSUBTC-101

СО	Description: After the completion of the course student will be able
CO1	Students will be develop the concept about the structure of carbohydrate, amino acids and higher order structure of proteins
CO2	Students will be able to illustrate the mechanism of activities of different types of enzymes.
CO3	Students will build up their concept about the structure of lipids and categorize the genetic materials of living organisms.
CO4	Students will be able to discuss the energetics of living organisms by studying metabolism of carbohydrates and lipids.
CO5	Students will be able to predict the role of metabolism of amino acids and nucleotides to produce different functional molecules in the biological system.

Paper Name: Lab on Biochemistry and Metabolism Paper Code: BSUBTC-191

со	Description: After the completion of the course student will be able
CO1	Students will be able to identify the chemical behavior of different types of sugars and estimate them from different biological samples.
CO2	Students will be able to identify physical and chemical properties of amino acids and proteins and estimate them from different biological samples.
CO3	Students will be able to build the knowledge about characteristics of lipids and estimate them from different biological samples.
CO4	Students will be able to elaborate the chemical behavior of DNA and RNA for distinguishing them from each other.
CO5	Students will be able to relate the properties of water during the characterization of biomolecules.

Paper Name: Cell Biology Paper Code: BSUBTC-102

со	Description: After the completion of the course student will be able
CO1	Students will be able to develop the basic idea of structure and function of prokaryotic and eukaryotic cells

CO2	Students will be able to discuss a detailed perspective of a cell including physiological properties, cell composition, growth, metabolic processes, signaling pathways, life cycle.
CO3	Students will be able to interpret the applications of different microscopy as tools for understanding cell biology.
CO4	Students will be able to discuss about cell cycles, cell division and apoptosis
CO5	Students will be able to assess the cell biology in microscopic and molecular level to understand of human health and disease

Paper Name: Lab on Cell Biology Paper Code: BSUBTC-192

со	Description: After the completion of the course student will be able
CO1	Students will be able to examine animal and plant cells
CO2	Students will be able to demonstrate micrographs of different cell components

CO3	Students will be able to illustrate the interactions of the cells and how cellular components are used to generate and utilize energy in cells
CO4	Students will be able to utilize their knowledge of cell biology to select examples of changes or losses in cell function and compare and contrast the events of cell cycle and its regulation.
CO5	Students will be able to appraise the laws of heredity with practical emphasis on inheritance.

Paper Name: English Communication Skill development Paper Code: BSUBTA-101

со	Description: After the completion of the course student will be able
CO1	Analyze and restate the meaning of a text in English
CO2	Demonstrate the skill to write in English without grammatical error
CO3	Practice listening effectively to communication in English
CO4	Develop the ability to speak English language with the right way of pronunciation

CO5	Express the viewpoints with confidence in English
CO6	Express values and skills gained through effective communication to other disciplines
C07	Compose articles and compositions in English
CO8	Discuss and socialize effectively in English

Paper Name: General Microbiology Paper Code: BSUBTC-201

со	Description: After the completion of the course student will be able
CO1	Student will be able to classify and discuss importance of bacteria, viruses, viroids and prions,
CO2	Students will be able to discuss the staining procedure of bacteria.
CO3	Students will be able to assess the growth pattern of microbes.

CO4	Students will be able to discuss the physical and chemical measures to control microbial growth.
CO5	Students will be able to discuss the importance of water and food bacteriology.

Paper Name: Lab on General Microbiology Paper Code: BSUBTC-291

СО	Description: After the completion of the course student will be able
CO1	Students will be able to classify and discuss the identity of viruses, viroids and prions through microscopy.
CO2	Student will be able to develop concept basic principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter)
CO3	Students will be able to test the proper sterilization of culture media for bacterial cultivation and analyze the growth pattern of bacteria.
CO4	Student will be able to examine different shapes of bacteria will be able to characterize them using permanent slides/ pictographs

CO5	Student will be able to examine the fungus by cotton blue staining

Paper Name: Plant and Mammalian Physiology Paper Code: BSUBTC-202

СО	Description: After the completion of the course student will be able
CO1	Student will be able to develop their concept about plant cell morphology and plant water relationship
CO2	Student will be able to assess the regulation of metabolic reactions in plant cell and the action of plant hormones
CO3	Students will be able to discuss the molecular consequence of digestion, absorption of foods through mammalian gut and pattern of regulation of mammalian respiration and circulation.
CO4	Student will be able to analyze the responsiveness of excitable tissues like nerve, muscle and regulation of secretory activity of endocrine glands

Paper Name: Lab on Plant and mammalian Physiology Paper Code: BSUBTC-292

CO Description: be able	After the completion of the course student will
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CO1	Student will be able to assess morphology of plant cells by differential staining
CO2	Students will be able to analyze the rate of photosynthesis and respiration.
CO3	Students will be able to compare the counting of erythrocytes and leukocytes from human blood and be able to determine the concentration of hemoglobin.
CO4	Students will be able to compare the morphology of different mammalian tissues from permanent and temporary stained sections.

Paper Name: Introduction to Environmental Science Paper Code: BSUBTA-201

со	Description: After the completion of the course student will be able
CO1	Gain knowledge about the environment and ecosystem.
CO2	about natural resources, its importance and environmental impacts of human activities on natural resources.
CO3	To gain knowledge about the conservation of biodiversity and its importance.

CO4	To know about problems of environmental pollution, its impact on human and ecosystem and control measures.
CO5	To learn about increase in population growth and its impact on environment

Paper Name: Introduction to Fundamental Computer Paper Code: BSUBTA-202

со	Description: After the completion of the course student will be able
CO1	Converse in basic computer terminology
CO2	Formulate opinions about the impact of computers on society
CO3	Possess the knowledge of basic hardware peripherals
CO4	Know and use different number systems and the basics of programming
CO5	Solve basic computational problems with C language

Paper Name: Genetics Paper Code: BSUBTC- 301

со	Description: After the completion of the course student will be able
CO1	Student will be able to compare between prokaryotic and eukaryotic genome
CO2	Students will be able to develop concepts about bacterial and Mendelian genetics.
CO3	Students will be able to analyze the activity of different kinds of operons and transposons.
CO4	Students will be able to assess different kinds of chromosomal aberrations and mutations.
CO5	Students will be able to analyze the gene expression through the chi-square test.

Paper Name: Lab on Genetics Paper Code: BSUBTC-391

со	Description: After the completion of the course student will
	be able

CO1	Students will be able to develop knowledge about the working principle of all instruments needed for practical genetics.
CO2	Students will be able to demonstrate the process of mitosis and meiosis.
CO3	Students will be able to analyze the karyotypes with the help of photographs.
CO4	Students will be able to develop pedigree charts of some common characters like blood group, color blindness and PTC tasting.
CO5	Students will be able to demonstrate Barr Body.

Paper Name: Chemistry I Paper Code: BSUBTC-302

со	Description: After the completion of the course student will be able
CO1	Students will be able to explain fundamental principles and theories for stabilization/destabilization of colloidal systems.
CO2	Students will be able to utilize LeChâtelier's Principle, how the equilibrium quantities of reactants and products are shifted by changes in the parameters of the chemical reactions.

CO3	Students will be able to develop the concept about properties of solutions that depend on the number of dissolved particles in solution, but not on the identities of the solutes.
CO4	Students will be able to discuss the reasonable mechanism for a chemical reaction.
CO5	Students will be able to develop the acid-base concept in aqueous and non-aqueous media and reactions in non-aqueous media.
CO6	Students will be able to build the fundamental concept about the structures and IUPAC nomenclature of organic compounds.
C07	Students will be able to build the concept about stereochemistry

Paper Name: Lab on Chemistry Paper Code: BSUBTC-392

со	Description: After the completion of the course student will be able
CO1	Students will be able to develop skills in the proper handling of apparatus and chemicals.

CO2	Students will be able to develop experimental skills of quantitative volumetric analysis and determination of physical properties of substances.
CO3	Students will be able to determine the "overall reaction order" for a chemical reaction using the (differential) rate law
CO4	Students will be able to analyze a titration with a pH electrode and determine the equivalence point.
CO5	Students will be able to develop skills in the proper handling of apparatus and chemicals.
CO6	Students will be able to identify the different chemical groups of organic compounds

Paper Name: Molecular Biology Paper Code: BSUBTC- 303

со	Description: After the completion of the course student will be able
CO1	Students will be able to explain the salient features of genetic material.
CO2	Students will be able to build concepts about Chromatin structure.

CO3	Students will be able to discuss the mechanisms of replication of DNA in prokaryotic and eukaryotic cells.
CO4	Students will be able to discuss the mechanism of transcription of gene and its post transcriptional modification
CO5	Students will be able to analyze the characteristics of mature mRNA, genetic codes and pattern of gene expression in prokaryotes.
CO6	Students will be able to demonstrate the process of different types of DNA damage, repair, recombination and gene cloning

Paper Name: Enzymology Paper Code: BSUBTS- 301

со	Description: After the completion of the course student will be able
CO1	Students will be able to Classify the enzymes according to the basis of their catalyzed reactions.
CO2	Students will be able to analyze and evaluate the kinetic behavior of enzymes
CO3	Students will be able to develop the concept and determine about different patterns of inhibitions of enzyme activity.

CO4	Students will be able to build the concept about the structures of active site of the enzymes and their mechanism of actions and their clinical application
CO5	Students will be able to develop the idea about enzyme immobilization and analytical kits.

Paper Name: Industrial Biotechnology Paper Code: BSUBTS-302

со	Description: After the completion of the course student will be able
CO1	Students will be able to explain the Production of industrial chemicals, biochemicals and chemotherapeutic products.
CO2	Students will be able to apply the knowledge of pharmacological technology and metabolic engineering for the production of industrially important products.
CO3	Students will be able to demonstrate the Purification & characterization of proteins, Upstream and downstream processing, solids and liquid handling
CO4	Students will be able to explain the enzyme kinetics, enzyme inhibitions, growth kinetics, mathematical derivations of batch and continuous culture operations.

Paper Name: Plant and Animal Chromosome Preparation and Karyotyping

Paper Code: BSUBTS-303

со	Description: After the completion of the course student will be able
CO1	Students will be able to explain primary structure, ultrastructure of prokaryotic and eukaryotic chromosomes and process of cytogenetics.
CO2	Students will be able to demonstrate the process of chromosome preparation from peripheral blood and bone marrow culture and processes of chromosome staining.
CO3	Students will be able to apply the knowledge of the staining process for chromosome studying in both plants and animals.
CO4	Students will be able to build their concept about the process of chromosome analysis and its interpretation

Paper Name: Immunology Paper Code: BSUBTC-401

со	Description: After the completion of the course student will be able
CO1	Students will be able to demonstrate a coherent understanding of the fundamental concepts in Immunology and understanding the complex relations among components of the immune system.

CO2	Students will be able to develop knowledge about immunoglobulin structures and diversity of antibodies, B-cell, T-cell, and their interaction with antigen.
CO3	Students will be able to explain the basic mechanisms of hypersensitivity responses and their associations with different diseases.
CO4	Students will be able to discuss basic understanding of immunology and immune responses in response to various infectious and non-infectious diseases.
CO5	Students will be able to develop awareness of the current research activities in the field and possible applications of this knowledge for the betterment of humanity.

Paper Name: Immunology Lab Paper Code: BSUBTC- 491

со	Description: After the completion of the course student will be able
CO1	Students will be able to evaluate different antigen-antibody interactions.
CO2	Students will be able to identify different components of immune system in human system

CO3	Students will be able to utilize different immunological techniques for research and clinical purposes.
CO4	Students will be able to estimate and compare amount of antigen/antibody present in different samples
CO5	Students will be able to assess different host pathogen interactions.

Paper Name: Chemistry II Paper Code: BSUBTC-402

СО	Description: After the completion of the course student will be able
CO1	Students will be able to explain the exclusive terminologies associated with thermodynamics and explain the basic concepts of thermodynamics i.e. heat transfer and its consequences with the thermodynamic system.
CO2	Students will be able to assess the difference between what the molecules are doing in a solid, liquid, and gas, including movement, spacing, and organization, and how this explains the physical characteristics of these states.

CO3	Students will be able to analyze the properties of solutions that depend on the number of dissolved particles in solution, but not on the identities of the solutes.
CO4	Students will be able to develop the concept of reaction rates and be able to use it to predict products, yields etc.
CO5	Students will be able to build the concept of using the symbols for protons, neutrons, electrons, positrons, alpha particles, beta particles, and gamma rays.

Paper Name: Lab On Chemistry Paper Code: BSUBTC-492

со	Description: After the completion of the course student will be able
CO1	Students will be able to develop skills in the proper handling of apparatus and chemicals.
CO2	Students will be able to develop experimental skills of quantitative volumetric analysis and determination of physical properties of substances.

CO3	Students will be able to determine the "overall reaction order" for a chemical reaction using the (differential) rate law
CO4	Students will be able to assess a titration with a pH electrode and determine the equivalence point.
CO5	Students will be able to develop skills in the proper handling of apparatus and chemicals.

Paper Name: Bio-Analytical Tools Paper Code: BSUBTC-403

со	Description: After the completion of the course student will be able
CO1	Students will be able to develop concept about different kinds of microscopy
CO2	Students will be able to develop different types of spectroscopy
CO3	Students will be able to develop the operation of different types of chromatography
CO4	Students will be able to determine a constituent of a compound by observing mass spectra and NMR spectra of respective compound

CO5	Students will apparatus.	be	able	to	develop	skills	to	handle	centrifuge

Paper Name: Bio-Analytical Tools Lab Paper Code: BSUBTC-493

СО	Description: After the completion of the course student will be able
CO1	Students will be able to develop concept about handling different kinds of microscopy for examining biological samples
CO2	Students will be able to develop the knowledge of handling different types of spectrometers.
CO3	Students will be able to develop the operation of thin layer chromatography.
CO4	Students will be able to develop the usage of pH meters.
CO5	Students will be able to develop skills to handle normal and cold centrifuge apparatus.

Paper Name: Molecular Diagnostics Paper Code: BSUBTS-401

со	Description: After the completion of the course student will be able
CO1	Students will be able to explain the salient features of different types of enzymes in clinical aspect
CO2	Students will be able to build concepts about the role of immunoassays in diagnosis of different diseases.
CO3	Students will be able to discuss the application of PCR, RFLP in the analysis of genetic background of a disease
CO4	Students will be able to discuss about the newly developed rapid diagnostic approaches
CO5	Students will be able to analyze the characteristics of different types of wild type and mutated molecular markers to detect a disease condition

Paper Name: Plant-Microbe Interaction Paper Code: BSUBTS- 402

со	Description: After the completion of the course student will be able
CO1	Students will be able to build the concept about biofertilizers.
CO2	Students will be able to explain the distribution of free nitrogen fixing microorganisms.
CO3	Students will be able to explain the physiological significance of mycorrhiza.
CO4	Students will be able to build their concept about organic farming.

Paper Name: Research Methodology Paper Code: BSUBTS-403

со	Description: After the completion of the course student will be able
CO1	Students will be able to examine important facts
CO2	Students will be able to analyze an event or process or phenomenon to identify the cause and effect relationship

CO3	Students will be able to develop new scientific tools, concepts and theories to solve and understand scientific and nonscientific problems
CO4	Students will be able to sive solutions to scientific, nonscientific and social problems
CO5	Students will be able to solve the problems occurring in our everyday life

Paper Name: Basics of Forensic Science Paper Code: BSUBTS-404

СО	Description: After the completion of the course student will be able
CO1	The student will be able to describe the fundamental principles and functions of forensic science and its significance to human society.
CO2	The student will be able to illustrate the divisions in a forensic science laboratory.
CO3	The student will understand the working of the forensic establishments in India and abroad.

Paper Name: Bioprocess Technology Paper Code: BSUBTC-501

со	Description: After the completion of the course student will be able
CO1	Students will be able to build the concept about basics and principles of fermentation processes, types of fermentation processes.
CO2	Students will be able to plan a research career or to work in the biotechnology industry with strong foundation about bioreactor design
CO3	Students will be able to apply modeling of bioprocesses so as to reduce costs and to enhance the quality of products and systems
CO4	Students will be able to build the concept about production processes and will be able to explain the steps involved in the production of bioproducts.

Paper Name: Bioprocess technology (Lab) Paper Code: BSUBTC- 591

со	Description: After the completion of the course student will be able
	be able
CO1	Students will be able to take part in screening of industrially important microorganisms
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CO2	Students will be able to analyze microbial growth kinetics of an industrially important microorganism
CO3	Students will be able to classify different types of bioreactors and various critical components of fermenters.
CO4	Students will be able to measure the microbial production of industrially important bioproduct

Paper Name: Recombinant DNA Technology Paper Code: BSUBTC-502

СО	Description: After the completion of the course student will be able
CO1	Students will be able to explain restriction and modification systems, ligation systems in bacteria and viruses and apply their appropriate use in recombinant DNA technology.
CO2	Students will be able to explain Cloning vectors for prokaryotes and eukaryotes and apply their appropriate use in recombinant DNA technology

CO3	Students will be able to discuss PCR ,DNA sequencing and choose their appropriate use in recombinant DNA technology
CO4	Students will be able to apply recombinant DNA technology in gene expression.

Paper Name: Recombinant DNA Technology (Lab) Paper Code: BSUBTC-592

СО	Description: After the completion of the course student will be able
CO1	Students will be able to demonstrate the Restriction and modification systems, ligation systems in bacteria and viruses and apply their appropriate use in recombinant DNA technology
CO2	Students will be able to develop the concept about isolation of cloning vectors for prokaryotes and eukaryotes and apply their appropriate use in recombinant DNA technology
CO3	Students will be able to demonstrate PCR, DNA sequencing and choose their appropriate use in recombinant DNA technology

CO4	Students will be able to apply recombinant DNA technology in gene expression through blue-white screening
CO5	Students will be able to demonstrate and apply RDT in Recombinant vaccines Gene therapy, agriculture - plant genetic engineering, herbicide resistant crops etc

Paper Name: Genomics, Proteomics and Bioinformatics Paper Code: BSUBTC-601

СО	Description: After the completion of the course student will be able
CO1	Students will be able to develop the concept about managing and distributing the genome data.
CO2	Students will be able to develop the idea about protein database
CO3	Students will be able to apply their knowledge of genomics and proteomics in determination of structure of a particular type of gene or protein.
CO4	Students will be able to construct different kinds of phylogenetic trees and analyze the molecular clock.

CO5	Students will be able to apply the bioinformatics tools to study Transcriptomics and proteomics.

Paper Name: Lab on Genomics, Proteomics and Bioinformatics Paper Code: BSUBTC-691

со	Description: After the completion of the course student will be able
CO1	Students will be able to take part in downloading macromolecular sequences from the NCBI database.
CO2	Students will be able to construct a non redundant database of sequences and data-set on the basis of the E-value.
CO3	Students will be able to compare the local and global alignment of proteins and domain architecture (DA) across different proteins.
CO4	Students will be able to select repeats in proteins using Pfam and repeats left undetected by Pfam.
CO5	Students will be able to construct phylogenetic tree using PHYLIP

Paper Name: IPR, Biosafety and Ethical Issues Paper Code: BSUBTC-602

со	Description: After the completion of the course student will be able
CO1	Students will be able to demonstrate awareness about Intellectual Property Rights (IPRs) to take measures to protect their ideas.
CO2	Students will be able to apply the knowledge to make business strategies by taking account of IPR to protect the products derived from biotechnology research and issues related to application and obtaining patents.
CO3	Students will be able to illustrate the knowledge on biosafety and risk assessment of products derived from recombinant DNA research and environmental release of genetically modified organisms, national and international regulations.
CO4	Students will be able to explain the regulatory affairs of Biotechnology research.
CO5	Students will be able to infer ethical aspects related to biological, biomedical, health care and biotechnology research.

Paper Name: IPR, Biosafety and ethical issues(Lab) Paper Code: BSUBTC-692

со	Description: After the completion of the course student will be able
CO1	Students will be able to demonstrate awareness about Intellectual Property Rights (IPRs) to take measures to protect their ideas.
CO2	Students will be able to apply the knowledge to make business strategies by taking account of IPR to protect the products derived from biotechnology research and issues related to application and obtaining patents.
CO3	Students will be able to illustrate the knowledge on biosafety and risk assessment of products derived from recombinant DNA research and environmental release of genetically modified organisms, national and international regulations.
CO4	Students will be able to explain the regulatory affairs of Biotechnology research.
CO5	Students will be able to infer ethical aspects related to biological, biomedical, health care and biotechnology research.

Programme Name: M.Sc. (Biotechnology) Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MSCBT/AllSem20.pdf

Paper Name: Biochemistry Paper Code: MSUBT-101

СО	Description: After the completion of the course student will be able
CO1	Illustrate various biomolecular components
CO2	Relate metabolic pathways, enzyme catalysis, disease pathogenesis
CO3	Analyze proteins, lipids, nucleic acid, saccharides structures and functional organizations,
CO4	Explain various biomolecular hierarchy, biochemical regulations and energetics
CO5	Determine structural formations and self-assembly systems for various pathological conditions from the perspective of biochemical reactions
CO6	Explain the practical aspects of Bioenergetics and its application

C07	Illustrate various biological metabolic pathways and their overall interaction.

Paper Name: Laboratory Techniques and Safety Paper Code: MSUBT-102

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со	Description: After the completion of the course student will be able
CO1	Illustrate the basic understanding of laboratory safety and health hazard
CO2	Apply the theory of different chromatographic, electrophoretic and blotting techniques in the separation and purification and identification of macromolecules.
CO3	Explain the phenomena of radioactivity and its different application
CO4	Apply the centrifugation procedures to isolate and separate biological macromolecules.
CO5	Make use of microscopy and other advanced laboratory techniques

CO6	Explain different types of optical and electron microscopy
CO7	Apply the modern nucleic acid sequencing methodology

Paper Name: Cell and Molecular Biology Paper Code: MSUBT-103

со	Description: After the completion of the course student will be able
CO1	Explain the structure and function of different intracellular organelles.
CO2	Build concept about Chromatin structure, DNA replication, transcription and protein synthesis
CO3	Demonstrate the mechanisms of protein trafficking at different cellular compartments.
CO4	Explain the regulatory mechanisms that control cellular reproduction and cell death.

CO5	Analyze the structure of the isolated cells and further manipulation on cells
CO6	Demonstrate the genome instability as well as cellular transformation
C07	Explain the basics of Mendelian Genetics and Inheritance pattern based of extension to the Mendelian genetics

Paper Name: Biostatistics Paper Code: MSUBT-104

со	Description: After the completion of the course student will be able
CO1	Demonstrate the basic sampling procedure, data collection and presentations.
CO2	Apply the theory of variability measurement, Correlation and regression.
CO3	Analyze the data related to significance of a test, probability and Distributions, and Computer oriented statistical techniques.

Paper Name: General Microbiology Paper Code: MSUBT-105

со	Description: After the completion of the course student will be able
CO1	Explain the microbial morphology, growth, culture method and genetics of bacteria, antimicrobial resistance and different methods of gene transfer.
CO2	Apply the knowledge of microbial classification and metagenomics for identification of unculturable microbes
CO3	Demonstrate the importance of bacterial gene transfer, mutations and recombination.
CO4	Explain the various types of interaction of microbes with biotic and abiotic stress.
CO5	Explain host-pathogen interaction, ecological impacts of microbes, microbial communication system and microbial fuel cells.
CO6	Demonstrate Antibiotic, Probiotic, Prebiotic, drug resistance, multiple drug resistance, Host- pathogen interaction.

Paper Name: Laboratory I: Biochemistry and Analytical Techniques Lab Paper Code: MSUBT-191

СО	Description: After the completion of the course student will be able
CO1	Demonstrate Spectroscopy
CO2	Apply buffer system
CO3	Analyze protein with gel electrophoresis
CO4	Estimate unknown concentration of protein
CO5	Estimate unknown DNA concentration

Paper Name: Laboratory II: Microbiology Lab Paper Code: MSUBT-192

со	Description: After the completion of the course student will be able
CO1	take part in preparation of medium for bacterial culture

CO2	take part in the maintenance of microbial culture
CO3	demonstrate staining of bacterial cell
CO4	compare the results of using various types of microscopic techniques
CO5	compare various biochemical tests for microbial identification.
CO6	determine minimum inhibitory concentration (MIC) and experimental procedure to isolate bacteria from environment

Paper Name: Laboratory III: Lab for Data Analysis using Statistical Software Paper Code: MSUBT-193

со	Description: After the completion of the course student will be able
CO1	take part in data analysis by different software.
CO2	demonstrate mean, median, mode, standard deviation and standard error of a given data set.

CO3	take part in the preparation of different types of graphs from a given data set.
CO4	analyze the statistical significance of the experimental data.
CO5	apply Wilcoxon test with confidence interval of median, two and three way anova, and Kaplan-Meier survival analysis system

Paper Name: Genetics and Molecular Diagnostics Paper Code: MSUBT-201

со	Description: After the completion of the course student will be able
CO1	Explain the genetics of bacteria, yeast and different types of bacteriophages.
CO2	Apply the knowledge of drosophila genetics as a background of model organisms.
CO3	Demonstrate the knowledge of population genetics and its application for evolution.
CO4	Explain an overview of chromosomal structure & mutations; DNA polymorphism: human identity

CO5	Demonstrate direct detection and identification of pathogenic- organisms through microscopy, ELISA, PCR and immunoprecipitation.
CO6	Demonstrate about quality oversight; regulations and approved testing (according to ICMR guideline)

Paper Name: Bioprocess Engineering and Technology Paper Code: MSUBT-202

со	Description: After the completion of the course student will be able
CO1	demonstrate on isolation, screening and maintenance of industrially important microbes; microbial growth and death kinetics
CO2	explain the Stoichiometry and models of microbial growth in the experimental conditions
CO3	build knowledge about designing of Bioreactor and the criteria of biological growth optimization strategies
CO4	classify different types of Downstream processing and product recovery.
CO5	Outline the experimental process on isolation of microorganisms of potential industrial interest; strain improvement; market analysis.

CO6	Analysis processin	on g ar	the nd its	application mechanism.	of	enzyme	technology	in	food

Paper Name: Immunology Paper Code: MSUBT-203

СО	Description: After the completion of the course student will be able
CO1	Infer the fundamental concepts of Immunology
CO2	Identify the cellular and molecular basis of immune responsiveness.
CO3	Explain the immune system in cancer, tumor immunology, vaccination and immunotherapy
CO4	Develop immunological experiments to predict the nature of immune response against bacterial, viral infection and allergic reaction.
CO5	Analyze genetic links of diseases and therapeutic interventions used against immunological disorders and infections.

CO6	Develop the basic concept on clinical immunology,	cancer
	immunology and transplantation	

Paper Name: Genetic Engineering Paper Code: MSUBT-204

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со	Description: After the completion of the course student will be able
CO1	Explain the applications of different tools for genetic engineering
CO2	Build concept about different types of vectors for gene cloning and expression
CO3	Apply different types of PCR techniques according to their application
CO4	Compare between different methods of cDNA analysis
CO5	Categorize gene silencing and genome editing technologies for the creation of transgenic plant and animal
CO6	Develop the basic concept on Gene silencing techniques; Transposon and jumping gene.

Paper Name: Applied Bioinformatics Paper Code: MSUBT-205

со	Description: After the completion of the course student will be able
CO1	Choose various bioinformatics software and databases to solve Sequence-alignment related problems
CO2	Interpret meaningful information from different databases, integrate and code for genetic sequences analysis
CO3	Examine accurate and comprehensive information about the structures and energies of biomacromolecules at an atomic level
CO4	Apply the bioinformatics tools to study Transcriptomics and proteomics.

Paper Name: Laboratory IV: Molecular Biology & Genetic Engineering Lab Paper Code: MSUBT-291

со	Description: After the completion of the course student will be able
CO1	Take part in Plasmid DNA isolation, DNA quantitation, gene transfer techniques and restriction enzyme digestion of plasmid DNA

CO2	Analyze polymerase chain reaction products using agarose gel electrophoresis
CO3	Explain competent cell preparation and transformation of E.coli with standard plasmids
CO4	Determine transformation efficiency, recombinant protein expression and inclusion body formation in E.coli
CO5	Estimate the purification of His-tagged plant protein using Ni-NTA columns

Paper Name: Laboratory V: Immunology Lab Paper Code: MSUBT-292

со	Description: After the completion of the course student will be able
CO1	Experiment with immunological techniques with the laboratory animals and human blood samples
CO2	Experiment with immunological techniques such as immunoblotting, ELISA, immunodiffusion.
CO3	Experiment with mammalian cell culture system

CO4	Experiment methods of bl	with lood	preparation collection.	of	antigens,	immunization	and

Paper Name: Industrial Biotechnology Paper Code: MSUBT-301

со	Description: After the completion of the course student will be able					
CO1	Demonstrate the basic concepts on different types of media preparation and bioreactors					
CO2	Demonstrate the basic concept of sustainability; Starch and sugar- based biorefinery					
CO3	Illustrate the First, second and third generations of bioethanol production and purification.					
CO4	Develop the knowledge of Production of recombinant and synthetic vaccines, purification, evaluation of the efficacy, stability, formulation of the product.					
CO5	Analyze the mechanism of Metabolic engineering for bioproduction.					

Paper Name: Plant & Animal Cell Culture Technology Paper Code: MSUBT-302

со	Description: After the completion of the course student will be able
CO1	Outline the Animal cell culture; media composition and growth conditions; Animal cell and tissue, Animal cell culture preservation; Anchorage and non-anchorage dependent cell culture; Primary and secondary culture; Animal cell growth characteristics and kinetics; Micro & macro carrier culture; Hybridoma technology; Stem cell technology;.
CO2	Explain the basic concepts on Totipotency; Plant growth regulators; Regeneration and micropropagation of plants: clonal propagation, organogenesis, shoot-tip and meristem culture, haploid culture, triploid culture, protoplast culture; Somaclonal variation; Tissue culture and Cell suspension culture system.
CO3	Apply the process development Principles, design and operation of bioreactors: specific design criteria for mammalian and plant systems; Strategies for fermentation with recombinant organisms; Isolation, characterization and production of secondary metabolites from different plant cell types

Paper Name: Genomics and Proteomics Paper Code: MSUBT-303

со	Description: After the completion of the course student will be able
CO1	Explain different aspects of Metagenome Sequencing and Analysis, Pre Sequencing Considerations, MPLING and Data Generation, Sequence Processing, Tools and Databases for Metagenomic Analysis.

CO2	Demonstrate Human Genome and its Evolution, Overview of the Human Genome, Protein Coding Genes in the Human Genome.
CO3	Build the concept Transcriptome and type of RNA molecules within Transcriptome, Transcriptome Evaluation Method.
CO4	Relate protein structural hierarchy and methods of isolation of proteins
CO5	Analyze protein sequence, structure and function
CO6	Explain applications of proteomics

Paper Name: Intellectual Property Rights, Biosafety and Bioethics Paper Code: MSUBT-304

со	Description: After the completion of the course student will be able
CO1	Students will be able to demonstrate awareness about Intellectual Property Rights (IPRs) to take measures to protect their ideas.
CO2	Students will able to apply the knowledge to make business strategies by taking account of IPR to protect the of products

	derived from biotechnology research and issues related to application and obtaining patents
CO3	Students will be able to illustrate the knowledge on biosafety and risk assessment of products derived from recombinant DNA research and environmental release of genetically modified organisms, national and international regulations
CO4	Students will be able to explain the regulatory affairs of Biotechnology research.
CO5	Students will be able to infer ethical aspects related to biological, biomedical, health care and biotechnology research

Paper Name: Laboratory VI: Bioprocess Engineering and Technology Lab Paper Code: MSUBT-391

СО	Description: After the completion of the course student will be able
CO1	demonstrate on isolation, screening and maintenance of industrially important microbes; microbial growth and death kinetics
CO2	explain the Stoichiometry and models of microbial growth in the experimental conditions

CO3	build knowledge about designing of Bioreactor and the criteria of biological growth optimization strategies
CO4	classify different types of Downstream processing and product recovery
CO5	Outline the experimental process on isolation of microorganisms of potential industrial interest; strain improvement; market analysis.
CO6	Analysis on the application of enzyme technology in food processing and its mechanism.

Paper Name: Laboratory VII: Applied Bioinformatics Lab Paper Code: MSUBT-392

со	Description: After the completion of the course student will be able
CO1	Take part in Downloading macromolecular sequences from the NCBI database.
CO2	Construct non-redundant database of sequences and data-set on the basis of the E-value
CO3	Compare the local and global alignment of proteins and domain architecture (DA) across different proteins.

CO4	Select repeats in proteins using Pfam and repeats left undetected by Pfam.	
CO5	Construct phylogenetic tree using PHYLIP	

Programme Name: Master of Science in Molecular Biology Syllabus link: http://makautexam.net/aicte_details/SyllabusI/MSCMOL/AllSem.pdf

Paper Name: Biochemistry Paper Code: MSUMB-101

СО	Description: After the completion of the course student will be able
CO1	Illustrate various biomolecular components
CO2	Relate metabolic pathways, enzyme catalysis, disease pathogenesis
CO3	Analyze proteins, lipids, nucleic acid, saccharides structures and functional organizations,
CO4	Explain various biomolecular hierarchy, biochemical regulations and energetics
CO5	Determine structural formations and self-assembly systems for various pathological conditions from the perspective of biochemical reactions

Paper Name: Laboratory Techniques and Safety Paper Code: MSUMB-102

со	Description: After the completion of the course student will be able
CO1	Illustrate the basic understanding of laboratory safety and health hazard
CO2	Apply the theory of different chromatographic, electrophoretic and blotting techniques in the separation and purification and identification of macromolecules.
CO3	Explain the phenomena of radioactivity and its different application
CO4	Apply the centrifugation procedures to isolate and separate biological macromolecules.
CO5	Make use of microscopy and other advanced laboratory techniques

Paper Name: Cell and Molecular Biology Paper Code: MSUMB-103

со	Description: After the completion of the course student will be able
CO1	Explain the structure and function of different intracellular organelles.

CO2	Build concept about Chromatin structure, DNA replication, transcription and protein synthesis
CO3	Demonstrate the mechanisms of protein trafficking at different cellular compartments.
CO4	Explain the regulatory mechanisms that control cellular reproduction and cell death.
CO5	Analyze the structure of the isolated cells and further manipulation on cells.
CO6	Demonstrate the genome instability as well as cellular transformation.
C07	Explain the basics of Mendelian Genetics and Inheritance pattern based on extension to Mendelian genetics.

Paper Name: Biostatistics Paper Code: MSUMB-104

со	Description: After the completion of the course student will be able
CO1	Demonstrate the basic sampling procedure, data collection and presentations.

CO2	Apply the theory of variability measurement, Correlation and regression.
CO3	Analyze the data related to significance of a test, probability and distributions, and Computer oriented statistical techniques.

Paper Name: Regulation of Gene Expression Paper Code: MSUMB-105

со	Description: After the completion of the course student will be able
CO1	Demonstrate Regulation of gene expression in prokaryotes and their viruses
CO2	Classify the different types of gene regulation mechanism in eukaryotic system, post transcriptional control, environmental impact on transcription and
CO3	Explain the chromosome organization and long-range control.
CO4	Apply the knowledge of RNA interference to control gene expression.

Paper Name: Laboratory I: Biochemistry and Analytical Techniques Paper Code: MSUMB-191

СО	Description: After the completion of the course student will be able
CO1	Demonstrate Spectroscopy
CO2	Apply buffer system
CO3	Analyze protein with gel electrophoresis
CO4	Estimate unknown concentration of protein
CO5	Estimate unknown DNA concentration

Paper Name: Laboratory II: Molecular Biology Lab Paper Code: MSUMB-192

со	Description: After the completion of the course student will be able
CO1	Analyze the concept of operon and its different parameters as well as diauxic growth curve of E. coli

CO2	Explain UV mutagenesis to isolate amino acid auxotroph
CO3	Analyze the Phage titre with λ phage/M13.
CO4	Analyze genetic transfer during conjugation and take part in gene mapping problems.
CO5	Take part in Plasmid DNA isolation, DNA quantitation, gene transfer techniques and restriction enzyme digestion of plasmid DNA
CO6	Analyze polymerase chain reaction products using agarose gel electrophoresis
C07	Explain competent cell preparation and transformation of E.coli with standard plasmids and transformation efficiency.
CO8	Estimate the purification of His-tagged plant protein using Ni-NTA columns

Paper Name: Laboratory III: Lab for Data Analysis using Statistical Software Paper Code: MSUMB-193

СО	Description: After the completion of the course student will be able
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CO1	take part in data analysis by different software.
CO2	demonstrate mean, median, mode, standard deviation and standard error of a given data set.
CO3	take part in the preparation of different types of graphs from a given data set.
CO4	analyze the statistical significance of the experimental data.
CO5	apply Wilcoxon test with confidence interval of median, two and three way anova, and Kaplan-Meier survival analysis system

Paper Name: Neurobiology & Developmental Biology Paper Code: MSUMB-201

со	Description: After the completion of the course student will be able
CO1	 The basic structure of nervous system, cellular and molecular building blocks, The Electrical Potential of a resting neuron, the nerve impulse, synaptic transmission, neurotransmitters and their release, integration of synaptic action.

CO2	> Properties of sensory systems, coding and control of sensory information, motor systems: muscle and its control, reflexes and pattern generation, sensory influence on motor output, the brain and motor output.
	> Development, developmental plasticity, behavioral plasticity: learning, hormones and the nervous system.
	> The neural basis of behavior, gene regulation in the nervous system
CO3	 Gametogenesis, Types and structure of eggs, Fertilization, Cleavage , Blastulation, Gastrulation, Placenta, In vitro Fertilization.

Paper Name: Genomics & Proteomics Paper Code: MSUMB-202

со	Description: After the completion of the course student will be able
CO1	Explain different aspects of Metagenome Sequencing and Analysis, Pre Sequencing Considerations, MPLING and Data Generation, Sequence Processing, Tools and Databases for Metagenomic Analysis.

CO2	Demonstrate Human Genome and its Evolution, Overview of the Human Genome, Protein Coding Genes in the Human Genome.
CO3	Build the concept Transcriptome and type of RNA molecules within Transcriptome, Transcriptome Evaluation Method.
CO4	Relate protein structural hierarchy and methods of isolation of proteins
CO5	Analyze protein sequence, structure and function
CO6	Explain applications of proteomics

Paper Name: Immunology Paper Code: MSUMB-203

со	Description: After the completion of the course student will be able
CO1	Infer the fundamental concepts of Immunology
CO2	Identify the cellular and molecular basis of immune responsiveness

CO3	Explain the immune system in cancer, tumor immunology, vaccination and immunotherapy
CO4	Develop immunological experiments to predict the nature of immune response against bacterial, viral infection and allergic reaction.
CO5	Analyze genetic links of diseases and therapeutic interventions used against immunological disorders and infections.

Paper Name: Genetic Engineering Paper Code: MSUMB-204

со	Description: After the completion of the course student will be able
CO1	Explain the applications of different tools for genetic engineering
CO2	Build concept about different types of vectors for gene cloning and expression
CO3	Apply different types of PCR techniques according to their application

CO4	Compare between different methods of cDNA analysis
CO5	Categorize gene silencing and genome editing technologies for the creation of transgenic plant and animal

Paper Name: Applied Bioinformatics Paper Code: MSUMB-205

CO	Description: After the completion of the course student will be able
CO1	Choose various bioinformatics software and databases to solve Sequencealignment related problem
CO2	Interpret meaningful information from different databases, integrate and code for genetic sequences analysis
CO3	Examine accurate and comprehensive information about the structures and energies of biomacromolecules at an atomic level
CO4	Apply the bioinformatics tools to study Transcriptomics and proteomics.

Paper Name: Laboratory IV: Genetic Engineering Paper Code: MSUMB-291
со	Description: After the completion of the course student will be able				
CO1	Take part in Plasmid DNA isolation, DNA quantitation, gene transfer techniquesand restriction enzyme digestion of plasmid DNA				
CO2	Analyze polymerase chain reaction products using agarose gel electrophoresis				
CO3	Explain competent cell preparation and transformation of E.coli with standard plasmids				
CO4	Determine transformation efficiency, recombinant protein expression and inclusion body formation in E.coli				
CO5	Estimate the purification of His-tagged plant protein using Ni-NTA columns				

Paper Name: Laboratory V: Immunology Paper Code: MSUMB-292

со	Description: After the completion of the course student will

CO1	Experiment with immunological techniques with the laboratory animals and human blood samples			
CO2	Experiment with immunological techniques such as immunoblotting, ELISA, immunodiffusion.			
CO3	Experiment with mammalian cell culture system			
CO4	Experiment with preparation of antigens, immunization and methods of blood collection.			
CO5	Experiment with immunological techniques with the laboratory animals and human blood samples			

Paper Name: Plant Biotechnology Paper Code: MSUMB-301

со	Description: After the completion of the course student will be able
CO1	Develop the basic concept on different types of plant tissue culture and sub-cellular organelles as well as the concept on plant growth and development

CO2	Demonstrate different types of gene transfer in plant cell
CO3	Build the basic concept on Seed structure and germination conditions as well as associated parameters.
CO4	Categorize the different types of stress on plants and its resistance mechanisms
CO5	Analyze the basic concept on bioreactors and plant secondary metabolites production

Paper Name: Immunotechnology Paper Code: MSUMB-302

со	Description: After the completion of the course student will be able
CO1	Explain the importance and mechanism of different drug molecules against inflammatory disorder
CO2	Build idea to utilize the macromolecules specifically antibodies to treat various diseases
CO3	Demonstrate the molecular mechanisms of Immunotherapy for allergic diseases

CO4	Develop	the	concept	therapeutic	implications	of	tumor
	Immunoio	igy tra	Insplantatio	on and immur	lodeficiency		

Paper Name: Signal Transduction & Oncology Paper Code: MSUMB-303

со	Description: After the completion of the course student will be able
CO1	Build concepts about cellular communication, cell signaling including receptors and signal molecules and ions.
CO2	Identify the molecular signaling for cell cycle regulation and programmed cell death.
CO3	Identify the molecular basis of cancer and the factors that can trigger the onset of cancer.

Paper Name: Intellectual Property Rights, Biosafety and Bioethics Paper Code: MSUMB-304

СО	Description: After the completion of the course student will be able
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CO1	Students will be able to demonstrate awareness about Intellectual Property Rights (IPRs) to take measures to protect their ideas.
CO2	Students will able to apply the knowledge to make business strategies by taking account of IPR to protect the of products derived from biotechnology research and issues related to application and obtaining patents
CO3	Students will be able to illustrate the knowledge on biosafety and risk assessment of products derived from recombinant DNA research and environmental release of genetically modified organisms, national and international regulations
CO4	Students will be able to explain the regulatory affairs of Biotechnology research.
CO5	Students will be able to infer ethical aspects related to biological, biomedical, health care and biotechnology research

Paper Name: Laboratory VI: Applied Bioinformatics Paper Code: MSUMB-391

СО	Description: After the completion of the course student will be able		
CO1	take part in Downloading macromolecular sequences from the NCBI database.		
CO2	construct non-redundant database of sequences and data-set on the basis of the E-value		
CO3	compare the local and global alignment of proteins and domain architecture (DA) across different proteins.		
CO4	select repeats in proteins using Pfam and repeats left undetected by Pfam.		
CO5	construct phylogenetic tree using PHYLIP		

Paper Name: Laboratory VII: Signal Transduction Paper Code: MSUMB-392

со	Description: After the completion of the course student will be able
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CO1	Take part in Tissue Culture Methods
CO2	Take part in lipid peroxidation assays (TBARS), Reactive oxygen species (ROS) generation assays, and H2O2 induced DNA fragmentation assays.
CO3	Explain Thyroid hormone induced gene expression, Infection of Tomato plants by Tomato leaf curl virus using molecular approach
CO4	Demonstrate the isolation of virus genomic component from field grown infected plants, Histochemical and fluorometric GUS assay, and Seed viability test.
CO5	Summarize the expression of different stress specific marker genes for the corresponding stress treatments in plants.