Syllabus for B.Tech(Marine Engineering) Second Year

Revised Syllabus of B.Tech in MRE (To be followed from the academic session, July 2011, i.e. for the students who were admitted in Academic Session 2010-2011)

SYLLABUS FOR 2nd YEAR 1st SEMESTER:

Sl. No.	Paper Code	Subject	Contact Hours / Week				Credit
			L	T	P	Total	
A	**Theory Papers**						
1.	HU - 301	Values & Ethics in Profession	3	0	0	3	3
2.	PH - 301	Physics - 2	3	1	0	4	4
3.	CH - 301	Basic Environmental Engineering & Elementary Biology	3	0	0	3	3
4.	MAT – 302	Applied Thermodynamics – I	2	1	0	3	3
5.	MMM - 303	Mechanics of Materials - I	2	1	0	3	3
6.	MWT - 304	Workshop Technology	2	0	0	2	2
7.	MEM – 305	Electrical Machines – I	3	0	0	3	3
Total of Theory						**21**	**21**
B	**PRACTICAL**						
1	PH - 391	Physics - 2	0	0	3	3	2
2	MML – 306	Mechanical Lab - I	0	0	2	2	1
3	MWP – 307	Workshop Practical	0	0	4	4	2
4	MMD - 308	Machine Drawing	0	0	3	3	2
Total of Practical						**12**	**7**
Total of Semester						**33**	**30**

L = LECTURE HOURS PER WEEK
T = TUTORIAL HOURS PER WEEK
P = PRACTICAL HOURS PER WEEK

Syllabus for B.Tech(Marine Engineering) Second Year

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SYLLABUS FOR 2nd YEAR 2nd SEMESTER:

Sl. No.	Paper Code	Subject	Contact Hours / Week				Credit
			L	T	P	Total	
A	**Theory Papers**						
1.	MECG – 401	Economics and Commercial Geography	2	0	0	2	2
2.	M(MM) - 402	Mathematics – III	2	1	0	3	3
3.	MMS - 403	Materials Science	2	0	0	2	2
4.	MAT – 404	Applied Thermodynamics – II	2	1	0	3	3
5.	MMM - 405	Mechanics of Materials – II	2	1	0	3	3
6.	MAM - 406	Marine Auxiliary Machines – I	3	0	0	3	3
7.	MEM – 407	Electrical Machines – II	3	0	0	3	3
Total of Theory						**19**	**19**
B	**PRACTICAL**						
1	HU - 481	Communication skill & Report writing Lab	0	0	3	3	2
2	MSML - 408	Practical Seamanship and Elementary Navigation Lab	0	0	2	2	2
3	MWP – 409	Workshop Practical	0	0	4	4	2
4	MED - 410	Marine Engineering Drawing	0	1	2	3	2
5	MMT - 411	Materials Testing Lab	0	0	2	2	1
Total of Practical						**14**	**9**
Total of Semester						**33**	**28**

L = LECTURE HOURS PER WEEK
T = TUTORIAL HOURS PER WEEK
P = PRACTICAL HOURS PER WEEK*THIRD SEMESTER*

Syllabus for B.Tech(Marine Engineering) Second Year

Revised Syllabus of B.Tech in MRE (To be followed from the academic session, July 2011, i.e. for the students who were admitted in Academic Session 2010-2011)

Structure FOR 3rd YEAR 1st SEMESTER:

Sl. No.	Paper Code	Subject	Contact Hours / Week				Credit
			L	T	P	Total	
A	**Theory Papers**						
1.	HU – 501	Management Science	2	0	0	2	2
2	MBSS - 502	Basic Ship Structure	2	0	0	2	2
3.	MAM - 503	Marine Auxiliary Machines – II	4	0	0	4	4
4	MMF - 504	Mechanics of Fluids	2	0	0	2	2
5	MMOM – 505	Mechanics of Machines - I	2	0	0	2	2
6	MMB - 506	Marine Boiler	2	0	0	2	2
Total of Theory						**14**	**14**
B	**PRACTICAL**						
1	MEML - 507	Electrical Machine Lab	0	0	2	2	1
2	MML - 508	Mechanical Lab – II	0	0	2	2	1
3	MWP – 509	Marine Workshop Practical	0	0	16	16	8
4	MEDR - 510	Marine Engineering Design & Drawing - I	1	0	3	4	2
Total of Practical						**24**	**12**
Total of Semester						**38**	**26**

L = LECTURE HOURS PER WEEK
T = TUTORIAL HOURS PER WEEK
P = PRACTICAL HOURS PER WEEK

Total no of weeks available in one semester … 18
Therefore, total training hrs in this semester = 684 HRS

Syllabus for B.Tech(Marine Engineering) Second Year

Revised Syllabus of B.Tech in MRE (To be followed from the academic session, July 2011, i.e. for the students who were admitted in Academic Session 2010-2011)

Structure FOR 3rd YEAR 2nd SEMESTER:

Sl. No.	Paper Code	Subject	Contact Hours / Week				Credit
			L	T	P	Total	
A	**Theory Papers**						
1	MAM-601	Marine Ship Construction	2	0	0	2	2
2.	MICE - 602	Marine I C Engine - I	3	0	0	3	3
3.	MMF - 603	Fluid Machines	2	0	0	2	2
4.	MMOM – 604	Mechanics of Machines - II	3	0	0	3	3
5	MSE – 605	Marine Steam Engineering	4	0	0	4	4
6.	MET - 606	Marine Electrical Technology - I	2	0	0	2	2
Total of Theory						**16**	**16**
B	**PRACTICAL**						
1	MMBL - 607	Boiler Chemical Lab & Fuel Oil & L Oil testing Lab	0	0	2	2	1
2	MML - 608	Mechanical Lab – III	0	0	2	2	1
3	MWP – 609	Marine Workshop Practical	0	0	16	16	8
Total of Practical						**20**	**10**
Total of Semester						**36**	**26**

L = LECTURE HOURS PER WEEK
T = TUTORIAL HOURS PER WEEK
P = PRACTICAL HOURS PER WEEK

Total no of weeks available in one semester … 18
Therefore, total training hrs in this semester = 648 HRS

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Revised Syllabus of B.Tech in MRE (To be followed from the academic session, July 2011, i.e. for the students who were admitted in Academic Session 2010-2011)

Structure FOR 4th YEAR 1st SEMESTER:

Sl. No.	Paper Code	Subject	Contact Hours / Week				Credit
			L	T	P	Total	
A	**Theory Papers**						
1.	MNAR - 701	Naval Architecture – I	3	0	0	3	3
2.	MICE - 702	Marine Internal Combustion Engine - II	4	0	0	4	4
3.	METM - 703	Marine Electrical Technology & Electrical Measurement	3	1	0	4	4
4.	MSSEP – 704	SSEP, Safe watch keeping & Personal Care - I	3	0	0	3	3
5	MSOM - 705	Ship Operation & Management	3	0	0	3	3
6.	MOPT – 706	Elective Subjects (Any One) A. Advanced Marine Heat Engines (Co-cycles) B. Advanced Fluid Mechanics C. Renewable Energy Sources & Applications D. Bio Mass E. EMI & EMC	3	0	0	3	2
Total of Theory						**20**	**19**
B	**PRACTICAL**						
1	MPPL - 707	Power Plant Lab	0	0	2	2	1
2	MEML - 708	Electrical Measurement Lab	0	0	2	2	1
3	MFCL – 709	Fire Control Lab	0	0	3	3	2
Total of Practical						**7**	**4**
C	**SESSIONAL**						
1	MMSD - 791	Marine Machinery System Design & Drawing	0	2	3	5	4
Total of Sessional						**5**	**4**
Total of Semester						**32**	**27**

L = LECTURE HOURS PER WEEK
T = TUTORIAL HOURS PER WEEK
P = PRACTICAL HOURS PER WEEK

Syllabus for B.Tech(Marine Engineering) Second Year

Revised Syllabus of B.Tech in MRE (To be followed from the academic session, July 2011, i.e. for the students who were admitted in Academic Session 2010-2011)

Structure FOR 4th YEAR 2nd SEMESTER:

Sl. No.	Paper Code	Subject	Contact Hours / Week				Credit
			L	T	P	Total	
A	**Theory Papers**						
1.	MSSEP – 801	SSEP, Safe Watch Keeping & Personal Care – II	3	0	0	3	3
2.	MNAR - 802	Naval Architecture – II	3	0	0	3	3
3.	MATE - 803	Marine Advanced Thermal Engineering	3	0	0	3	3
4.	MCEA – 804	Control Engineering & Automation	4	0	0	4	3
Total of Theory						**13**	**12**
B	**PRACTICAL**						
1	MCTR - 806	Control & Simulator Lab	0	0	4	4	2
Total of Practical						**4**	**2**
C	**SESSIONAL**						
1	MTP - 805	Technical Paper, Project & Model Making	0	2	4	6	4
2	MGV - 891	Grand Viva					3
Total of Sessional						**6**	**7**
Total of Semester						**23**	**21**

L = LECTURE HOURS PER WEEK
T = TUTORIAL HOURS PER WEEK
P = PRACTICAL HOURS PER WEEK

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THEORY PAPER

Values & Ethics in Profession (HU – 301)

DETAILED SYLLABUS
Science, Technology and Engineering as knowledge and as Social and Professional Activities **Effects of Technological Growth:** Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development Energy Crisis: Renewable Energy Resources Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics Appropriate Technology Movement of Schumacher; later developments Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis. Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology. **Ethics of Profession:** Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies. **Profession and Human Values:** Values Crisis in contemporary society Nature of values: Value Spectrum of a good life Psychological values: Integrated personality; mental health Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution. Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity Moral and ethical values: Nature of moral judgments; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

Books:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.

3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

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Revised Syllabus of B.Tech in MRE (To be followed from the academic session, July 2011, i.e. for the students who were admitted in Academic Session 2010-2011)

PHYSICS - 2 (PH – 301):

Code: PH-301
Contacts: 4L
Credit: 3+1

Module 1:

Vector Calculus:

1.1 Physical significances of grad, div, curl. Line integral, surface integral, volume integral- physical examples in the context of electricity and magnetism and statements of Stokes theorem and Gauss theorem [No Proof]. Expression of grad, div, curl and Laplacian in Spherical and Cylindrical co-ordinates. 2L

Module 2 :

Electricity

2.1 Coulumbs law in vector form. Electrostatic field and its curl. Gauss's law in integral form and conversion to differential form . Electrostatic potential and field, Poisson's Eqn. Laplace's eqn (Application to Cartesian, Spherically and Cylindrically symmetric systems – effective 1D problems) Electric current, drift velocity, current density, continuity equation, steady current.

5L

2.2 Dielectrics-concept of polarization, the relation $D=\varepsilon_0 E+P$, Polarizability. Electronic polarization and polarization in monoatomic and polyatomic gases. 3L

Module 3:

Magnetostatics & Time Varying Field:

3. Lorentz force, force on a small current element placed in a magnetic field. Biot-Savart law and its applications, divergence of magnetic field, vector potential, Ampere's law in integral form and conversion to differential form. Faraday's law of electro-magnetic induction in integral form and conversion to differential form. 3L

Module 4:

Electromagnetic Theory:

4.1 Concept of displacement current Maxwell's field equations, Maxwell's wave equation and its solution for free space. E.M. wave in a charge free conducting media, Skin depth, physical significance of Skin Depth, E.M. energy flow, & Poynting Vector.

6L

Module 5:

Quantum Mechanics:

5.1 Generalised coordinates, Lagrange's Equation of motion and Lagrangian, generalised force potential, momenta and energy. Hamilton's Equation of motion and Hamiltonian. Properties of Hamilton and Hamilton's equation of motion.

4L

Course should be discussed along with physical problems of 1-D motion

5.2 Concept of probability and probability density, operators, commutator. Formulation of quantum mechanics and Basic postulates, Operator correspondence, Time dependent Schrödinger's equation, formulation of time independent Schrödinger's equation by method of separation of variables, Physical interpretation of wave function ψ (normalization and probability interpretation), Expectation values, Application of Schrödinger equation – Particle in an infinite square well potential (1-D and 3-D potential well), Discussion on degenerate levels. 9L

Module 6:

Statistical Mechanics:

3.1 Concept of energy levels and energy states. Microstates, macrostates and thermodynamic probability, equilibrium macrostate. MB, FD, BE statistics (No deduction necessary), fermions, bosons (definitions in terms of spin, examples), physical significance and application, classical limits of quantum statistics Fermi distribution at zero & non-zero temperature, Calculation of Fermi level in metals, also total energy at absolute zero of temperature and total number of particles, Bose-Einstein statistics – Planck's law of blackbody radiation.. 7L

Basic Environmental Engineering & Elementary Biology (CH – 301):

DETAILED SYLLABUS
General: Basic ideas of environment, basic concepts, man, society & environment, their interrelationship. Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-a-vis population growth, Sustainable Development. Materials balance: Steady state conservation system, steady state system with non conservative pollutants, step function. Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering.

Ecology: Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem- components types and function. Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban); Food chain [definition and one example of each food chain], Food web.

Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur].

Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity.

Air pollution and control: Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause.

Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems.

Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food.Global warming and its consequence, Control of Global warming. Earth's heat budget.

Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion).

Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model. Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant.

Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. Smog, Photochemical smog and London smog.

Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozone modification.

Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference).

Water Pollution and Control:

Hydrosphere, Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. River/Lake/ground water pollution: River: DO, 5 day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river[deoxygenation, reaeration], COD, Oil, Greases, pH. Lake: Eutrophication [Definition, source and effect]. Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only)

Standard and control: Waste water standard [BOD, COD, Oil, Grease], Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening]

Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition. Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic

Land Pollution

Lithosphere; Internal structure of earth, rock and soil

Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste).

Noise Pollution:

Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise]

Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L10 (18hr Index), Ld_n . Noise pollution control.

Environmental Management:Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol.

References/Books

1. Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.

De, A. K., "Environmental Chemistry", New Age International.

APPLIED THERMODYNAMICS – 1 (MAT – 302):

DETAILED SYLLABUS

Boilers and Evaporators: Basic concepts, Requirements of a good boiler, Boiler Calculations: Boiler thermal efficiency and Equivalent evaporation, Basic Calculations on the effect of Condenser Leakage and impure Feed, dissolved solids in Boilers. Density of water and its control in Boilers & Evaporators. Basic Calculations on performance of single-effect, multi-effect and Flash-type Evaporators; Applied Problems.

Ideal Gas Cycles: 4 Stroke Otto Cycle, Diesel Cycle, Dual combustion Cycle, Cycle, Criteria of Performance, compression Ratio and Thermal Efficiency, Indicator Diagrams; Indicated Power, Brake Power, Friction Power, Mechanical Efficiency, Specific Fuel consumption, Energy Balance, Applied Problems.

Stea**m cycle:** Carnot cycle for steam and Ideal Efficiency. Rankine cycle with dry saturated steam and superheated steam. Feed Pump work. Rankine Efficiency, work Ratio, Reheating and Regenerative Feed Heating and their effect on Thermal Efficiency. Applied Problems. Binary Vapour cycle, Introduction to Nuclear Power Plants.

Reciprocating Compressors: Ideal cycle for compressors, work Transfer in single stage Compressor, Mass and volume flow. Free Air Delivery, Effect of clearance and volumetric Efficiency in Single stage compressors, Multi-stage compression neglecting clearance and with clearance. Condition for Minimum work Input and Perfect Intercooling, Applied Problems.
Properties of Mixtures of Gases and Gas & Vapour: Dalton's Law of partial pressure, Amagat's Law of partial volume, Volumetric and Gravimetric Analysis of Gas Mixtures, Gibb's – Dalton Law, Mean value of a Gas constant. Equivalent Molecular weight, Density, specific volume, Specific Heat and Molar Heat capacity of gas mixture. Air and Water vapour mixture, Specific Humidity, Relative Humidity, Dew point, unsaturated and saturated Air

TEXT BOOK: Engineering Thermodynamics by P. K. Nag

REFERENCE BOOK: 1. Applied Thermodynamics by Onkar Singh

MECHANICS OF MATERIALS – 1 (MMM – 303):

Simple stress and Strains:: Concept of Stress and Strain and their relationship in deformable solids. Normal, and shear stress and the corresponding strains. Poisson's Ratio and complementary shear stress. Thermal Stress.
Compound Stress and Strain:: Stresses on an Oblique section, General two dimensional stress system, Materials subjected to Direct & Shear Stresses, Principal plane & Principal Stresses. Strain on an oblique section. Determination of principal strains. Principal strains in 3-dimensions. Principal Stresses determined from Principal Strains. Mohr's Diagrams for Stress, Strain and Strain Rosette
Thin & Thick Walled Shells:: Stresses and Strains in thin Walled Shells subjected to internal pressure. Thick cylinders, Lame's theory, compound cylinders, solid shaft subjected to radial pressure, shrinkage allowance. Applied problems.
Shearing Force and Bending Moment:: Sign Convention, Relation between Intensity of loading. Shearing Force and Bending Moment. Graphical construction of Bending Moment & Shear Force diagrams.
Bending Stress:: Pure Bending, 2nd moment of area, Stresses due to bending. Position of Neutral axis, Radius of Curvature, Combined bending and direct stress. Short Column with eccentric loading.
Torsion, Combined bending and Torsion:: Simple torsion, Combined bending and Twisting, Equivalent bending moment and Torsion, shear, bending and torsion, Closed coiled helical Springs

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WORKSHOP TECHNOLOGY (MWT – 304) :

DETAILED SYLLABUS
Common workshop tools description and uses of different types of calipers, Straight edges, try squares, vices, Hammers, chisels, Scrapers, files, Drills, reamers, Tapes, V-Blocks, face plate, Marking blocks, Carpentry tools, Patten maker's tools, smithy tools Moulding tools.
Machine process & Machine Tools the geometry of cutting processes machines of cutting, chip formation, cutting forces and power, Friction of chip on tools Generation and dissipation of heat in cutting. Standard nomenclature for cutting tools. Cutting speeds and feeds, estimation of machining time. The fundamental Cutting process. Application in hand tools as chisel, file and saw, geometrical control of the cutting edge. Kinematic analysis, specification, operation and inspection of the more important types of metal cutting machine tools including Centre lathes, Capstan and turret lathes, Automatic lathes, drilling and boring machines Shaping slotting and planning machines, Milling and broaching machines. Turning, Screw cutting and taper turning processes on Centre lathe, Abrasive process, Grinding, honing and lapping by hand and machines Shears and punches. Wood working machines. Principles of jigs and fixtures Standardization.
Measuring Instruments & Inspection: Description and use of steel rule, Vernier's scale, Micrometer, Dial gauge, Depth gauge, thread gauge, Feeler gauge, Wire Gauge, pattern maker's scale, Taper gauge, snap gauge, plug gauge, Optical methods of measurement, Principles of interchangibility, limit system. Use of limit gauge.
Fitting and Overhauling: Types of packing and jointing materials and their uses. Design considerations and construction of various types of valves and cocks, Reducing valves for steam and air. Bedding of bearings, marking of engine parts for fitting, machining operations fitting of keys cotters, etc.
Safety Measures: Sources of danger and methods of protection. Types of guards and safety devices, factory Act regulations.
Welding; Welding Equipment & Applications, Electric welding (A.C & D.C) Spot-welding. Gas welding, soldering & Blazing. Different Welding & Electrodes, Solders & Brazing Fluxes

TEXT BOOK: Workshop Practice by Hazra Chowdhury

REFERENCE BOOK: 1. Workshop Practice by Lindbers
2. Workshop Practice by Chapman

ELECTRICAL MACHINE – I (MEM – 305):

DETAILED SYLLABUS
Direct current machines-principle of working, winding, e.m.f. equation, armature reaction, commutation, brush shift, compensating winding etc.
D.C. generator, their characteristics, methods of excitation, parallel operation, equalizer busbar, performance

characteristic.
D.C. motor-their characteristics, starting and reversing, speed-torque equations, starters, speed control, testing of d.c. machines for finding out losses and efficiency, braking of d.c. motor.
D.C. and A.C. transmission and distribution-two wire and three wire d.c. system, use of balancer, a.c. transmission single phase and three phase, three wire four wire distribution, comparision of d.c. and a.c. transmission, effect of voltage drop, copper utilization under different systems, single and double fed distributors, fuses, d.c. air circuit breaker, a.c. air and oil circuit breakers.
Transformers – Principle of action, e.m.f. equation, phasor diagrams for no load conditions, useful and leakage flux, leakage reactance, equivalent circuits, voltage regulation, losses and efficiency, open circuit and short circuit tests, parallel operation, three phase transformer – core and shell type auto transformer, current and potential transformer.
Single phase induction motor – principle and operational characteristics, starting control, constructional details. Failure and repair of electrical machines

TEXT BOOK: Electrical Machinery by Dr. S. K. Dey

REFERENCE BOOK: 1. Electrical Machines by Dr. S. K. Bhattyacharya
2. Reed's vol-6

LABORATORY:

PHYSICS - 2 (PH – 391):

Code: PH-391
Contacts: (2P)
Credit: (2)

Group 1: Experiments on Electricity and Mangentism

1. Determination of dielectric constant of a given dielectric material.
3. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
4. Determination of the thermo-electric power at a certain temperature of the given thermocouple.
5. Determination of specific charge (e/m) of electron by J.J. Thomson's method.

Group 2: Quantum Physics

6. Determination of Planck's constant using photocell.
7. Determination of Lande'g factor using Electron spin resonance spetrometer.
8. Determination of Stefan's radiation constant
9. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
10. Determination of Rydberg constant by studying Hydrogen/ Helium spectrum

Group 3: Modern Physics

11. Determination of Hall co-efficient of semiconductors.
12. Determination of band gap of semiconductors.

13. To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells.

a) A candidate is required to perform 3 experiments taking one from each group. Initiative should be taken so that most of the Experiments are covered in a college in the distribution mentioned above. Emphasis should be given on the estimation of error in the data taken.

b) In addition a student should perform one more experiments where he/she will have to transduce the output of any of the above experiments or the experiment mentioned in c] into electrical voltage and collect the data in a computer using phoenix or similar interface.

c) Innovative experiment: One more experiment designed by the student or the concerned teacher or both.

Note:

i. Failure to perform each experiment mentioned in b] and c] should be compensated by two experiments mentioned in the above list.
ii. At the end of the semester report should sent to the board of studies regarding experiments, actually performed by the college, mentioned in b] and c]
iii. Experiment in b] and c] can be coupled and parts of a single experiment.

Recommended Text Books and Reference Books:

For Both Physics I and II

1. B. Dutta Roy (Basic Physics)
2. R.K. Kar (Engineering Physics)
3. Mani and Meheta (Modern Physics)
4.. Arthur Baiser (Perspective & Concept of Modern Physics)

Physics I (PH101/201)

Vibration and Waves

3. Kingsler and Frey
4. D.P. Roychaudhury
5. N.K. Bajaj (Waves and Oscillations)
6. K. Bhattacharya
7. R.P. Singh (Physics of Oscillations and Waves)
8. A.B. Gupta (College Physics Vol.II)
9. Chattopadhya and Rakshit (Vibration, Waves and Acoustics)

Optics

1. Möler (Physical Optics)
2. A.K. Ghatak
3. E. Hecht (Optics)
4. E. Hecht (Schaum Series)

5. F.A. Jenkins and H.E. White
6. 6. Chita Ranjan Dasgupta (Degree Physics Vol 3)

Quantum Physics
1. Eisberg and Resnick
2. A.K. Ghatak and S. Lokenathan
3. S.N. Ghoshal (Introductory Quantum Mechanics)
4. E.E. Anderson (Modern Physics)
5. Haliday, Resnick and Crane (Physics vol.III)
6. Binayak Dutta Roy [Elements of Quantum Mechanics]

Crystallography
1. S.O. Pillai (a. Solid state physics b. Problem in Solid state physics)
2. A.J. Dekker
3. Aschroft and Mermin
4. Ali Omar
5. R.L. Singhal
6. Jak Tareen and Trn Kutty (Basic course in Crystallography

Laser and Holography
1. A.K. Ghatak and Thyagarajan (Laser)
2. Tarasov (Laser)
3. P.K. Chakraborty (Optics)
4. B. Ghosh and K.G. Majumder (Optics)
5. B.B. Laud (Laser and Non-linear Optics)
6. Bhattacharyya [Engineering Physics] Oxford

Physics II(PH 301)

Classical Mechanics (For Module 5.1 in PH 301)
H. Goldstein
A.K. Roychaudhuri
R.G. Takwal and P.S. Puranik
Rana and Joag
M. Speigel (Schaum Series)
J.C. Upadhya (Mechanics)

Electricity and Magnetism
2. Reitz, Milford and Christy
3. David J. Griffith
4. D. Chattopadhyay and P.C. Rakshit
5. Shadowitz (The Electromagnetic Field)

Quantum Mechanics
7. Eisberg and Resnick
8. A.K. Ghatak and S. Lokenathan
9. S.N. Ghoshal (Introductory Quantum Mechanics)
10. E.E. Anderson (Modern Physics)
11. Haliday, Resnick and Crane (Physics vol.III)

12. Binayak Dutta Roy [Elements of Quantum Mechanics]

Statistical Mechanics
1. Sears and Sallinger (Kinetic Theory, Thermodynamics and Statistical Thermodynamics)
2. Mondal (Statistical Physics)
3. S.N. Ghoshal (Atomic and Nuclear Physics)
4. Singh and Singh
5. B.B. Laud (Statistical Mechanics)
6. F. Reif (Statistical Mechanics)

Dilectrics
7. Bhattacharyya [Engineering Physics] Oxford

MECHANICAL LABORATORY - 1 (MML – 306):

DETAILED SYLLABUS
To verify the Principles of Moment with the help of (a) Bell Crank Lever & (b) Lever apparatus
To determine the magnitude and nature of forces acting on the different members of (a) Simple Jib Crane, (b) Shear Leg Apparatus
To determine the deflection of a Loaded Beam.
To determine the co-efficient of friction between wood and glass in an inclined plane.
To prove that if a system of coplanar forces are in equilibrium, the links respectively given in magnitude and direction taken in order, from a closed polygon.
To find out the Mechanical Advantage, Velocity Ratio, Theoretical Effort, Efficiency, friction, and draw graphs with load as base for (i) Efficiency, (ii) Actual Effort, (iii) Mechanical Advantage and (iv) Friction for the following machines: (a) Screw Jack; (b) Worm and Worm Wheel; (c) Compound Wheel and Axle, (d) Single Purchase Crab and (e) Double Purchase Crab.
To determine the value of ‘g’ (acceleration due to gravity) by means of- (a) Atwood’s Machine, and (b) Fletcher’s Trolley
To determine the Moment of Inertia and Radius of Gyration of a Fly Wheel.
To determine Absolute Viscosity and Kinematic Viscosity of oil by Red Wood Viscometer.
To determine the Flash Point of a given sample of oil.

WORKSHOP PRACTICALS (MWP – 307):

DETAILED SYLLABUS
Workshop Layout; Using of Measuring tools like Micrometer and Vernier. Globe Valve & Gate Valve Overhauling; Cock Overhauling; Shaft Key Making; Thread cutting by Taps & Die; Thread cutting by Lathe Machine. General Overhauling Work: Overhauling of a steam stop valve Cutting of joints and packing for various uses. Welding Practice Familierisation of Marine Machineries.

MACHINE DRAWING (MMD – 308):

DETAILED SYLLABUS
Sketching of the followings: Screw Threads, Screw Fastenting, Rivets and riveted joints then keys, Cotter joints and pin joints
Machinery Component Drawing: Drawing of complete machine components in assembly (Orthographic to Orthographic and isometric of Orthographic) with details like couplings, Glands, Return and non-return valves, cocks & plugs, cylinder and piston assembly connecting rod with bearings, Boiler mountings.
Marine component Drawing: Assembly Drawings of simple marine components in Orthographic projection from Isometric views e.g. Bilge Strainer Boxes, Marine Diesel Piston & 4 stroke types, Control Valves, Cylinder Relief Valve, Boiler Blow-down valves, Diesel Engines' Rocker arms.
Projection of Ports: Projection of Port and Openings in hollow cylinders. Parallel cut & radial cut ports; Rectangular & tapered ports in right cylinders; Tapered ports in tapered cylinders; Example of diesel cylinder liners; Steam piston valve liner and blow down cock.

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FOURTH SEMESTER

THEORY PAPER:

ECONOMICS & COMMERCIAL GEOGRAPHY (MECG – 401)

DETAILED SYLLABUS
PART - A Importance of economics in Marine Engineering study, Basic economic concepts and terms, Demand analysis, Supply analysis, Elasticity of demand, Elasticity of supply.
Factors of production, Forms of business organization, Economic system with reference to India.
Production function, Law of return, Economics of scale, Iso-product and Iso-cost, Cost-concepts, Cost-output relationship and cost curves in short period, Long period, Revenue - concept, Determination of price under free market and price control by Govt. Types of market, Factors governing extent of market, Pricing under perfect competition, Monopoly, Monopolistic competition and oligopoly.
Money:- Types, Functions, Standard. Inflation :- Types, Causes. Commercial Banks - Functions, Functions of Central Banks. Features of Money and Capital market. National Income concepts.
Taxation - Direct and Indirect, Govt. Budgets. Economic development, Growth, features of underdevelopment with reference to India. Globalisation of Indian economics.
PART - B Difference between Domestic and foreign trade. Basis of International Trade: - Trade-theories. Free-Trade Vs Protection. Balance of paymentscomponents, causes of deficit, steps to correct deficit. Exchange-Rates :Types, determination, Devaluation of currency. Free- convertibility of currency with reference to Indian Rupee. Functions of I.M.F, World Bank, W.T.O.
Major Shipping Routes. Ports :- Types, Problems, factors for good port. Major ports of Indian and World. Port-pricing. Pollution of water - causes and remedies. Deep-sea fishing, Major sea-fishing zofles, Off-shore oil producing zones. India's overseas Trade and Economic Importance with reference to Economic zones.
Allocation of market resources in a wealth-maximising manner, Public policy issue in marine transportation, Chartering of ships, Flag of convenience, Policy of protection and subsidy.

MATHEMATICS- III (M(MM) –402):

Note 1: The whole syllabus has been divided into five modules.

Note 2: Structure of the question paper

There will be three groups in the question paper. In Group A, there will be one set of multiple choice type questions spreading the entire syllabus from which 10 questions (each carrying one mark) are to be answered. From Group B, three questions (each carrying 5 marks) are to be answered out of a set of questions covering all the five modules. Three questions (each carrying 15 marks) are to be answered from Group C. Each question of Group C will have two or three parts covering not more than two modules. Sufficient questions should to be set covering the whole syllabus for alternatives.

Module-1

Fourier Series: Introduction, Periodic functions, Even and odd function, Special wave forms, Euler formulae for Fourier coefficients, Dirichlet's conditions and sum of the Fourier series, Half range Fourier series, Parseval's identity (Statement only).

Fourier Transform: Fourier Transform and its properties, Inverse Fourier Transform (Statement only), Fourier Transform of derivatives (Statement only), Convolution theorem (Statement only), Related problems. [8]

Module-2

Introduction to Partial Differential Equations : Linear and quasi-linear equations of first order, Classification of integrals, Lagrange's Method and Charpits method of solution, Special types of first order equations, Cauchy's Problem, Neumann problem and Dirichlet problems.

Solution of one dimensional wave equation, One dimensional heat- conduction equation, Laplace equation in two dimension by the method of i: Separation of variables ii: Integral Transforms (Laplace and Fourier Transforms) [12]

Numerical Analysis:

Module-3

Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors. [4]

Interpolation: Newton's forward and backward interpolation formulae with error terms. Numerical integration: Trapezoidal and Simpson's 1/3rd rule with corresponding error terms. Solution of polynomial and transcendental equations: Bisection method, Newton-Raphson method. [6]

Numerical solution of a system of linear equations: Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Jacobi and Gauss-Seidel iterative methods. [6]

Module-4

Application to Ordinary Differential Equations: Numerical solution of first order ordinary differential equation with initial condition by Picard's, Euler's & Taylor series methods; Runge-Kutta Method, Predictor-Corrector methods (Milne & Adams-Bashforth), Introduction to the numerical methods of solutions of BVP's. [6]

Module-5

Application to Partial Differential Equations: Finite difference approximations to partial derivatives, Solution of Laplace & Poisson's equations using standard five point formula & diagonal five point formula, Solution of one dimensional heat conduction equation by Schmidt method and Crank Nicolson method. [6]

Text Books:

1. Amaranath, T.(1997), An Elementary Course In Partial Differential Equations, Narosa Publishing House.
2. Jain M. K., Iyengar S. R. K. and Jain R. K. (2003), Numerical Methods (Problems and Solution), New Delhi: New Age. International

3. Scarborough, J. B. (1966), Numerical Mathematical Analysis, Oxford Book Co.
4. Tolstov , Georgi P. (1976), Fourier Series, Dover.
5. Sastry, S. S. (2006), Introductory Methods of Numerical Analysis, PHI.

References:

1. Gockenbach, Mark S. (2002), Partial Differential Equations Analytical and Numerical Methods, Philadelphia : Society for Industrial and Applied Mathematics (SIAM).
2. Hildebrand, F. B. (1974), Introduction to Numerical Analysis (2nd edition ed.), McGraw-Hill.
3. Larsson, S. and Thomee, V. (2003), Partial Differential Equations with Numerical Methods, New York: Springer-Verlag.

MATERIALS SCIENCE (MMS – 403):

DETAILED SYLLABUS
Metals and alloys; Different types of iron and steel; their manufacture, properties and uses in industry. Alloys of iron and steel. Non-ferrous metals and alloys. Properties and uses; Miscellaneous engineering materials; their properties and uses.
Solid Solution: Properties of solid solutions and alloys. Types of Binary alloys, thermal Equilibrium Diagrams. Cooling curves, Eutectic and peritectic alloys. Intermetallic compounds.
Iron carbon equilibrium diagram: Phases in the Fe-C system, Invariant reactions, critical temperatures. Microstructures of slowly cooled steels. Effect of alloying elements on the Fe-C diagram, ferrite and austenite stabilizers. The TTT diagram, drawing of TTT diagram, TTT diagram for hypo & hyper eutectoid steels, effect of alloying elements on CCT diagram.
Heat Treatment: Heat treatment principles and processes (Annealing, normalizing, hardening, tempering, martempering, austempering, hardenability. Surface hardening like carburizing, cyaniding, nitriding, and induction hardening) Effect on structure and properties.
Fatigue & Creep: S-N curves, Factors affecting fatigue life and protection methods. The creep curves, mechanism of creep, creep resistant materials.
Corrosion and its prevention: Mechanism of corrosion, chemical Corrosion, Electrochemical corrosion, Anodic and Cathodic protection. Forms of metallic coatings. Anodising, Phosphating.
Selection of Materials in Shipbuilding & Marine Engineering: Boilers, Steam and Gas turbine and diesel engine components. Pumping Machinery , Piping. Engine seating. Propellers and rudders. Composition, strength value and other requirements for materials used.
Miscellaneous Engg. Materials: Refractories, Insulating materials; Plastics and Rubber; PVC, Resins, Paints etc. Properties and selection of various materials for various engineering applications.
Testing of Materials: Destructive tests; Tensile; Compression Test; Hardness Test; Bend test; Torsion Test & Impact Test. Non-destructive Tests; Magnetic Dust; Fluorescent Test; Ultrasonic Test; Radiography Test etc.

Text Books:

1. Materials Science and Engineering – An introduction; William D Callister Jr; Wiley India Pvt. Ltd., 6th Edition, 2006, New Delhi

2. Essentials of Materials for Science and Engineering, 4th edition Donald R Askeland and Pradeep, P. Phule, Thomson – Engineering (2006)

Reference Books:

1. Introduction to Material Science for Engineering – 6th Edition, James F Shackel, Ford Pearson, Prentice Hall, New Jersey, 2006

2. Foundations of materials science and engineering – Smith, 3rd ed. McGraw hill 1997

3. Physical Metallurgy – Principles and Practices by V. Raghavan, PHI,2nd Edition, 2006, New Delhi

APPLIED THERMODYNAMICS – II (MAT - 404):

DETAILED SYLLABUS
Fuels, Combustion & Dissociation: Definition of Fuel, combustion. Combustion Equation, Analysis of the Products of Combustion, stoichiometric combustion, Actual combustion, Air requirement, Excess Air, Dissociation. Effect of Dissociation on I.C. Engines.
Steam Nozzles: One Dimensional steady flow of compressible fluids, lsentropic flow, Flow through Nozzles and Diffuser. Critical condition, Mach Number, Subsonic, Sonic and Supersonic Flow. Flow of steam through Nozzles and Diffusers. Applied Problems.
Steam Turbines: General Principles of Impulse and Reaction Turbines-Velocity Diagrams for simple Impulse and Impulse-Reaction Turbine. Compounding of Impulse Turbine-Pressure and velocity compounding. Force on blades, Work done by Blades, Axial Thrust, Blade or Diagram Efficiency. Effect of Friction on Blades, Applied Problems.
Refrigeration: Reversed Carnot cycle, Vapour compression cycles, Refrigerating Effect, Co-efficient of performance, cooling capacity, Rating of a Refrigerating Plant, Methods of improving C.O.P. Multistage refrigeration cycle, Use of Vapour Tables, Applied Problems.
Transmission of Heat: Fourier's Law of Heat conduction. Thermal conductivity of Insulating materials. Conduction through flat & cylindrical, spherical surfaces in series. Heat Transfer from fluids through walls. Heat Exchanger: parallel flow and counter flow, Prediction of convection Heat Transfer rates. Use of Non-Dimensional Groups. Prandtl No. Nusselt No., Reynolds No., Stanton No., Grashof No, Graetz No.. etc, Natural and Forced Convection.

MECHANICS OF MATERIALS – II (MMM - 405):

Detailed syllabus
Welded Joints:: Strength of Welded Joints. Torsion effect on welded joint.
Theories of failure.
Deflection of Beams: Strain energy due to bending. Application of impact. Deflection by integration, Macaulay's Method. Moment area Methods of deflection coefficients. Deflection due to shear. Applied problems.
Stain Energy:: Concept of strain Energy, Strain Energy due to normal stress; Strain Energy due to impact loads; Resilience. Strain energy due to bending and torsion.
Thin Curved bar: Castigliano's theorem and its application to curved bars. Applied problems – statically determinate and indeterminate.
Struts: Euler's theory and Euler's buckling load. Struts with both ends pin joined, both ends fixed, one end fixed and one end free, one end hinged. Pin joined strut with eccentric load, Rankine-Gordon Formula. Applied problems.
Built-in beams: Moment-area method, built-in beam with central concentrated load, built-in beam with uniformly distributed load, with load not at center, Macaulay's method.

MARINE AUXILIARY MACHINERY-1 (MAM 406):

DETAILED SYLLABUS
Engine Room Layout: Lay out of main and auxiliary machinery in engine rooms in different ships. Piping arrangement for steam, bilge, ballast and oil fuel systems, Lub oil and Cooling system with various fittings. Domestic fresh water and sea water hydrophore system.
Pumps: Types of pumps for various requirements, their characteristics and application in ships. Centrifugal, Gear Pumps, Screw pumps and Reciprocating pumps. Care and Maintenance of pumps.
Evaporators: Construction and Operation of different types of evaporators. Fresh Water generators. Fresh Water generators and distillers. Conditioning arrangements of distilled water for drinking purpose. Care Maintenance of pumps of various types.
Deck Machinery: Various types of deck machinery used in ships e.g. Winches, and Wind lass, their requirements. Operations and maintenance. Deck Cranes.
Filters: strainers and filters, types of marine filters, autocleaner and Duplex filters, Static filters. Priming and core maintenance of filters.
Heat Exchangers: tubular and plate type, reasons of corrosion, tube removal, plugging, and materials used.
Steering gears: Operation and Constructional details of various types of steering machinery. Telemotor systems,

transmitters and receivers Variable Delivery Pumps used in steering gears, axial and radial displacement types. Hunting action of Steering gear. Emergency Steering arrangement. Care and Maintenance of Steering Gear Plants. Shafting : Methods of shaft alignment, constructional details and working of Thrust blocks. Intermediate shaft bearing and Stern tube bearing. Oil water lubricated stern Tubes. Sealing Glands. Stresses in Tail End, Intermediate and Thrust Shafts.
Dry Docking : Methods of dry docking of ships. Inspection and routine overhauling of underwater fittings and hull. Measurement of clearances and drop. Removal and fitting of propellers.

ELECTRICAL MACHINE – II (MEM - 407):

DETAILED SYLLABUS
Three phase induction motor: principle of operation and theory of action, slip speed, rotor to stator relationship, rotor frequency, rotor e.m.f. and current, equivalent circuit relationship between rotor IR loss and the rotor slip characteristics, starting torque and maximum running torque, reversing, speed control of induction motor, starting of induction motor, testing of motor, use of circle diagram.
Alternators: general arrangement of alternators, construction of salient pole and cylindrical-rotor types of stator windings, single and double layer windings, e.m.f. equation of an alternator, distribution and pitch factor, waveform of generated e.m.f., alternator on load, percentage regulation, internal voltage drop, production of rotating magnetic field, resultant magnetic field distribution, mathematical derivation of the rotating field condition, reversal of direction of rotation of rotating field.
Synchronous alternator and motor: Armature reaction in synchronous alternator, armature reactance, prediction of voltage regulation, open circuit test, short circuit test, synchronous impedence method, torque/angle characteristics, infinity busbar, synchronizing current, torque and power, hunting of phase swinging, parallel operation of alternators, a.c. generators in parallel excitation control, throttle control, load sharing –KW and KVA, principle of action of three-phase synchronous motor, effects of varying load and excitation, methods of starting, Excitation control advantages and disadvantages of synchronous motor.

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LABORATORY:

COMMUNICATION SKILL AND REPORT WRITING LAB (HU - 481):

PAPER NAME : TECHNICAL REPORT WRITING & LANGUAGE LABORATORY PRACTICE
PAPER CODE: HU 481/
CONTACT: 1L+2P
CREDIT : 2

Guidelines for Course Execution:

Objectives of this Course: This course has been designed:

1. **To inculcate a sense of confidence in the students.**
2. **To help them become good communicators both socially and professionally.**
3. **To assist them to enhance their power of Technical Communication.**

Detailed Course Outlines:

A. ***Technical Report Writing*** : 2L+6P

1. Report Types (Organizational / Commercial / Business / Project)
2. Report Format & Organization of Writing Materials
3. Report Writing (Practice Sessions & Workshops)

B. ***Language Laboratory Practice***

I. Introductory Lecture to help the students get a clear idea of Technical Communication & the need of Language Laboratory Practice Sessions 2L

2. Conversation Practice Sessions: (To be done as real life interactions) 2L+4P

a) Training the students by using Language Lab Device/Recommended Texts/cassettes /cd's to get their Listening Skill & Speaking Skill honed

b) Introducing Role Play & honing over all Communicative Competence

3. Group Discussion Sessions: 2L+6P

a) Teaching Strategies of Group Discussion

b) Introducing Different Models & Topics of Group Discussion

c) Exploring Live /Recorded GD Sessions for mending students' attitude/approach & for taking remedial measure

Interview Sessions; 2L+6P

- ***a) Training students to face Job Interviews confidently and successfully***
- ***b) Arranging Mock Interviews and Practice Sessions for integrating Listening Skill with Speaking Skill in a formal situation for effective communication***

4. Presentation: 2L+6P

- ***a) Teaching Presentation as a skill***
- ***b) Strategies and Standard Practices of Individual /Group Presentation***
- ***c) Media & Means of Presentation: OHP/POWER POINT/ Other Audio-Visual Aids***

5. Competitive Examination: 2L+2P

- ***a) Making the students aware of Provincial /National/International Competitive Examinations***
- ***b) Strategies/Tactics for success in Competitive Examinations***
- ***c) SWOT Analysis and its Application in fixing Target***

Books – Recommended:

Nira Konar: English Language Laboratory: A Comprehensive Manual

PHI Learning, 2011

D. Sudharani: Advanced Manual for Communication Laboratories & Technical Report Writing
Pearson Education (W.B. edition), 2011

References:

Adrian Duff et. al. (ed.): Cambridge Skills for Fluency
A) Speaking (Levels 1-4 Audio Cassettes/Handbooks)
B) Listening (Levels 1-4 Audio Cassettes/Handbooks)
Cambridge University Press 1998

Mark Hancock: English Pronunciation in Use
4 Audio Cassettes/CD'S OUP 2004

PRACTICAL SEAMANSHIP, ELEMENTARY NAVIGATION LAB (MSML 408):

DETAILED SYLLABUS
Seamen & their duties : Ship's Department, General ship knowledge and nautical terms like Poop-Deck Forecastle, Bridge etc.
Deck Equipment: Windlass, Derricks Cranes, Gypsy, Capstan, Hatches, and their function.
Navigational Lights and Signals : Port and Starboard and aft mast light, Colours and Location. Look out, Precautions and Bad weather, Flags used on ships, Flag etiquette, Morse and Semaphore signaling, Sound signals.
Rope Knots and Moorings :Types of knots. Practice of knot formation, Materials of ropes, Strength, Care and maintenance, use of mooring line, heaving line, Rat guards, Canvas and its use.
Anchors : Their use, Dropping and Weighing anchor, Cable stopper.
Navigation :General knowledge of principle stars. Sextant, Navigation compasses, Echo Sounder, Log and uses, barometer and weather classification, G.M.T. and Zonal time, wireless Navigational Instruments, radar satellite Navigation etc.
Life boats & Life rafts: Construction, equipment carried, carrying capacity. Davits and their operation, Launching of Life rafts (Inflatable type). Embarkation into lifeboat and Life raft. Survival pack, Stowage and securing arrangement. Douing the life jackets, life boat drills, lowering & hoisting of life boats.

WORKSHOP PRACTICAL (MWP - 409):

DETAILED SYLLABUS
Reciprocating Pump Overhauling. Centrifugal Pump Overhauling; Air Compressor Overhauling; Boiler Familiarization: Line Tracing Machine Shop Job

Double-V Weld; T-Weld Pipe repair & Fabrication; Diesel Engine Familiarization & Parts Overhauling.

MARINE ENGINEERIG DRAWING (MED - 410):

DETAILED SYLLABUS
Drawing : Advanced Marine Machinery assembly drawings.
Part - I (Auxiliary Machine) Marine machinery components as assorted stop & sluice valves and auxiliary equipment dismantled; to be conceptualised in assembly and laid out as working & functional parts. Sectional views in elevation & plans executed. Part sectional views depiction.
Part - II (Main machine) Marine engine components dismantled. Assembled drawings of pistons, thrust blocks, liners, connecting rods, crossheads, injection valves, starting valves, Fuel pumps, Stern tube & Tail shaft, Rudder carrier bearing and all equipment with main machinery. Sectional! Outside and plan views of parts fitted ! removed & in functional order.

MATERIAL TESTING LABORATORY (MMT – 411):

DETAILED SYLLABUS
To determine the behaviour of different materials when subjected to Tension and to obtain the following Tensile properties of materials on Universal Testing Machine: (i) UTS, (ii) Yield Stress, (iii) Young's Modulus, (iv) Breaking Stress, (v) Percentage Elongation, (vi) Percentage reduction in area and (vi) Plotting of Curve of –Stress vs Strain.
To determine the behaviour of materials under direct shear force and to study the effect of it and to calculate the shear stress of material.
To study the behaviour of materials when subjected to bending and to find out the effect of such act on material and to calculate the bending stress of materials.
To Determine of the behaviour of different materials when subjected to sudden shock and to the impact resistance quality or the impact strength of the materials.
To determine the hardness of materials by indenting a hardened steel ball into the specimen under test by an applied specified load on the ball.
To determine of behaviour of ductile materials when subjected to torsion and to obtain: i) Max. torsion stress ii) Modulus of rigidity iii) Plotting of curve of Angle of Twist vs Torque.
To determine the stiffness of spring for a) round wire, b) square section wire when subjected to compression.
Determination of compressive stress and strain of materials under compressive force applied to the material.
To find out the Tensile stress of materials on hand operated Tensile testing machine

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FIFTH SEMESTER

THEORY SUBJECTS

MANAGEMENT SCIENCE (HU - 501): 36HRS

DETAILED SYLLABUS
Introduction to Management Principles & Practice: Need for sound Management principles and Practice & Growth of Modern management through, various Managerial Functions, Planning, Organising, staffing, Directing, controlling & Co-ordination; Principles of Locating a Plant & Developing Organisation Structure. Various Types of organization structure. Various types of organizational structures; Authority & Responsibility. Boundaries of Authority.
Production Management: Functions of production Planning and Control, Product Development Principles, Standardization, simplification & Specialization, Plant Layout & Material Handling, Introduction to Operations Research. Linear Programming, Distribution Methods, Network Technique in Management – Critical Path Method (CPM), programme Evaluation & Review Technique (PERT). Resources Allocation & load smoothing, Operational Sales Forecasting; Inventory Control, Safety stock, Determinational Introduction to Decision. Theories in Management, Decision under Certainty, Right and uncertainity, Works Study, Job Evaluation & Merit Rating, Quality Control, Preventive Maintenance.
Finance : Methods of capital formation & control of Working Capital, Continuous & Discounted Cash & Project Apparaisal, Break even Analysis, Cost Benefit Analysis, Methods of Depreciation Factory Costing, Estimating, Balance Sheet, Financial & Physical Ratios; Project & Budgetary Control.
Personnel Management : The personnel function Requirement & Selection Role of Psychological Tests in Reqcruitments Training Performance Appraisal and Reward System, Legal Requirements and Regulation of Working Condition, Employer's Liabilities for Health and Safety, Leadership and Discipline, Motivation and Incentives, Problems of Accident – Proveners, Fatigue, etc., Relationship with Trade, Union and Workers Participation in Management.

BASIC SHIP STRUCTURE (MBSS 502): 36 HRS

DETAILED SYLLABUS
Ships Terms: Various terms used in ship Construction with reference to Ship's parameter e.g.L.B.P. Moulded Depth, Moulded draught etc. General Classification of Ships.
Stresses in Ship's structure: Hogging, Sagging, Racking, Pounding, Panting, etc. and Strength members to counteract the same.
Sections and materials use: Type of section like Angles, Bulb Plates. Flanged beams used in ship construction. Rivetting & Welding. Testing of welds. Fabricated components.
Bottom & side Framing: Double bottoms, Water tight floors, Solid and bracket floors, Longitudinal framing keels, side framing like Tankside brackets, Beam knee, Web Frame, etc.
Shell & Decks : Planting system for shells, Deck plating & Deck girders, discontinuities like hatches and other openings. Supporting & closing arrangements, mid-ship Section of ships.
Bulk heads & Deep Tanks: Water tight bulkheads, Arrangements of plating and stiffeners. Water tight openings through bulkheads for electric

cables pipes and shafting. Deep tank for oil fuel or oil cargo corrugated bulk heads.
Fore-End Arrangements: Stem construction. Arrangement to resist panting, panting stringers, Forepeak-Collision bulk heads Bulbous bows. Anchor and cable arrangements.
After-End-Arrangements: Stem construction. Arrangements to resist panting, panting stringers, Forepeak-Collision bulk heads. Bulbous bows. Anchor and cable arrangements.

MARINE AUXILIARY MACHINERY – II (MAM - 503): 72 HRS

DETAILED SYLLABUS
Oil Purification: Theory of oil Purification, Principles of operation and construction of different Centrifuges for heavy fuel and lubricating oil.
Blowers and Compressors: Operational and Constructional details of blowers and Compressors used on board ships. Uses of compressed air.
Other Ship board equipments: Incinerators, Sewage Treatment Plant, Engine room crane, chain blocks, tackles, Anchor chain, its testing and survey requirements.
Different types of ship stabilizer. Bow Thrusters, Hull protection arrangements.
Marine Refrigeration and A.C. Plants: design and Constructional details of various equipment for refrigeration and Airconditioning Refrigerators used in marine practice and their justification, Control of temperature in various rooms in Cargo or domestic Plants. Control of Humidity in A.C. Plants. Operation and maintenance of Plants. Control and Safety equipment.
Machinery and Cargo Ventilation: Design and constructional details, International Requirements, Operation & maintenance of Equipment.
Noise and Vibrations: Elements of aerodynamics and hydrodynamics sound, Noise sources on Ships and noise suppression techniques, Noise level measurement. Various modes of vibration in a ship (i.e. free, forced, transverse, axial torsional – Their sources and effects), Resonance and critical speed, Structure borne, and air borne vibration, Anti vibration mountings of machines. Detuners, Dampers with reference to torsional vibrations dampers, use of torsiographs.
Fuels: Source of supply, Study of Primary Fuels, Coal, petroleum, natural gas, classification of fuels. Treatment of fuels for combustion in marine I.C.E. and steam plants.
Lubrication: Theories of Lubrication, Types of Lubricants and their Properties suitability of Lubricants for various uses; solid and fluid lubricants. Additive Oils and their specific use, Teminology used in Lubrication systems. Loading pattern of various bearings in marine use and Lubrication system adopted. Different types of bearings used for marine machineries.

MECHANICS OF FLUIDS (MMF - 504): 36 HRS

DETAILED SYLLABUS
Introduction : Definition of Fluid. Different properties, i.e. capillarity, Surface tension, viscosity etc.
Hydrostatics : Fluid pressure; Measurement of pressure; total thrust due to liquid pressure on immersed plane and curved surface; Centre of pressure; Total force and center of pressure on immersed surfaces such as Tanks, bulkheads, lock gates, manhole doors etc. Concepts of buoyancy, condition of floating, conditions for Equilibrium of floating and submerged bodies, Metacentre.
Fluid in Motion:- Energy of flowing fluid, pressure energy, potential energy, kinetic energy total energy; Bernoulli's Equation for steady motion; Variation in pressure head along a pipe. Measurement of pipe flow rate by venturimeter, Discharge through a small orifice under a constant head; Co-efficient of discharge for a small orifice. Time required to empty reservoirs of various shapes
Flow through pipes: Losses of energy in pipe lines; losses due to sudden increase in pipe diameter. Losses due to sudden contraction in diameter,

Friction losses, Darcey's formula; series and parallel flow through pipes; flow from one reservoir to the other reservoir; Equivalent pipe, Transmission of power by pipe line; Condition for maximum power transmission.
Fluid Friction, Viscous and Laminar flow: Resistance co-efficient, variation of resistance co-efficient with Reynold's; oiled bearings; Viscous flow; Flow between parallel planes; Critical velocity; Viscous flow in pipes; Power required for viscous flow;

MECHANICS OF MACHINES – I (MMOM - 505): 36 HRS

DETAILED SYLLABUS
Kinematic and link-Mechanisms: Relative motion between bodies moving in different planes. Instantaneous method; Rubbing velocities at pin joints. Graphical construction for relative velocity and acceleration in different link and sliding mechanisms. Analytical Determination of velocity and acceleration. Forces in Crank and connecting rods. Inertia force on a link connecting rods etc. Effect of friction.
Belt and Rope Drives: Open and cross Belt dimensions, ratio of belt tension; Modification for V-groove pulleys; Rope drive; Power of Belt drives and maximum power transmitted. Effect of Centrifugal tension; Dynamometer and their working principles, Absorption Dynamometer Band & rope Brake Dynamometer, Hydraulic Dynamometer
Governors: Functions of governor; comparison between a Governor and a fly wheel; Various types of Governors - Centrifugal and inertia types of Governors; Sensitiveness; Stability and Hunting of Governors; Governor effort and power Consideration of friction in governors.
Turning Moment of Flywheel: Function of a flywheel, Crank effort diagrams. Fluctuation of speed and energy. Effect of centrifugal tension of flywheel, Inertia torque and its effects on Crank effort diagrams.
Cams: Types of cams and followers, Specified motion of followers. Uniform acceleration & deceleration, S.H.M. and uniform velocity Graphical construction of cam-profile. Radial Cam.
Analytical design procedure for cams with straight flank, Curved flank, Circular flank with various types of followers Spring force and Reaction Torque. In-line cams and off center cams.

MARINE BOILER (MMB - 506): 36 HRS

DETAILED SYLLABUS
General Considerations governing the design of Boilers: Types of marine boilers, comparison of smoke tube and water boilers; Destructive and Non destructive tests on plates, rivets, welded seams, classification societies requirements for boilers construction.
Smoke Tube Boilers: Various types in marine use, Principal dimensions and staying of flat surface of multitubular cylindrical Boilers. Vertical Auxiliary Boilers.
Water Tube Boilers: General description with sketches of principal types of boilers in marine use, Superheater, Economizer, Air preheater & steam preheater; circulation and use of Unheated Down comers in highly rated boilers; Superheat temperature control, Attemperators and Desuperheaters.
Waster heat boilers; Waste heat recovery calculation, Lamont exhaust gas boiler. Scotch composite Boiler, Cochran exhaust gas and composite boiler, spanner marine exhaust gas and Composite boiler. Forced Water Circulation boiler, Double evaporation Boiler.
Boiler Mountings: Safety Valves- Improved High Lift, Full lift and full Bore type: Gauge glass- Ordinary plate type and remote Indicator; Automatic feed regulator, three element High & Low water level alarms, Main Steam stop valves, Retractible type Soot blower etc.
Operation, Care & Maintenance: Precommissioning procedures, Hydraulic, steam raising and operating procedures, Action in the event of storage of water. Blowing down of boiler, Laying up a boiler; General maintenance. External and internal tube cleaning. Tube renewals, etc. maintenance,

inspection and survey of boilers.
Refractory : Purposes of refractory, types of refractory and reasons for
Oil burning: 1. Procedure of Liquid fuel burning in open furnace. 2. Various types of atomizer. 3. Furnace arrangement for oil burning. 4. Boiler Control System i.e. master control, fuel control, air control and viscosity control.

LABORATORIES:

ELECTRICAL MACHINES LAB (MEML - 507): 36 HRS

DETAILED SYLLABUS
1. To study and run rotary convertor under different conditions to record the generated voltage on d.c. side against variation of load.
2. To perform load test on a 6-pulse, 2 way bridge rectifier and to obtain the characteristic curves.
3. To study the slip-torque characteristics of an induction motor and to find out the full load slip.
4. To study the different types of Motors, connect the motor AG. supply, run the motor and obtain its speed load characteristics. (The experimental multi-motor set).
5. To determine the regulation of a 3-phase alternator by synchronous impedance method.
6. To compute full load input, torque, slip, power factor and efficiency of 3-phase induction motor from circle diagram. Also to compare the results from the circle diagram with actual full load test on the motor.
7. Synchro transmeter and Repeater.
8. Transformer connections.
9. Determination of phase-sequence of the given 3-phase supply.
10. Study of single-phase controller.
11. Observation of the wave-form of magnetizing current and hysteresis loop.
12. Study of transformer differential relay.

Syllabus for B.Tech(Marine Engineering) Second Year

Revised Syllabus of B.Tech in MRE (To be followed from the academic session, July 2011, i.e. for the students who were admitted in Academic Session 2010-2011)

MECHANICAL LAB - II (MML - 508): 36HRS

Conduct any 8 (eight) of the following experiments:

DETAILED SYLLABUS	
1	To verify the relation $T = 2\pi\sqrt{\frac{l}{g}}$ in case of simple pendulum and to plot the graph T^2 Vs L.
2	To verify the relation $T = 2\pi\sqrt{\frac{k^2 + OG^2}{g.OG}}$ in case of compound pendulum, and find the radius of gyration and equivalent length of compound pendulum.
3	To determine the moment of inertia of different bodies by the Bifilar suspension by experiment and by calculation.
4	To verify the relation $T = 2\pi\sqrt{\frac{W}{gK}}$ in case of longitudinal vibration of helical spring.
5	To draw the characteristics curves for the Watt Governor and to find stability & sensitivity. OR, To investigate the effects of varying the mass of the center sleeve of the Porter governor and to draw the characteristics curves for the same and to find stability & sensitivity.
6	To measure circular and liner displacements of cam and flower in case of Plate cam-Reciprocating follower
7	To determine the Thermal Conductivity of good conductors.
8	To determine the thermal conductivity of insulating materials.
9	To determine effectiveness and efficiency of a pin fin or extended surface
10	To study the Heat Transfer through Forced Convection
11	To determine LMTD for parallel and counter flow arrangement
12	To determine COP and tonnage capacity of a refrigeration plant.

MARINE WORKSHOP PRACTICAL (MWP – 509): 288 HRS

DETAILED SYLLABUS	
1.	Dismantling, overhauling, inspection & assembling of Centrifugal Pump.
2.	Dismantling, overhauling, inspection & assembling of a gear pump & screw pump.
3.	Dismantling, overhauling, inspection & assembling of a reciprocating pump
4.	Dismantling, overhauling, inspection & assembling of variable displacement pump (swash plate)
5.	Dismantling, overhauling, inspection & assembling of sludge pump.
6.	Dismantling overhauling & testing of fuel injector.
7.	Dismantling, overhauling, inspection & assembling of Air Compressor.
8.	Dismantling, overhauling, inspection & assembling of purifier.
9.	Inspection & Overhauling of air bottle, mountings.
10.	Dismantling, overhauling, inspection & assembling of shell & tube type cooler.

11.	Dismantling, overhauling, inspection & assembling of plate type cooler.
12.	Operation & working principles of F.W. Generator & Reverse osmosis system.
13.	Operation & working principles of oily water separator.
14.	Overhauling inspection & assembling of Boiler safety v/v.
15.	Overhauling inspection & assembling of feed check v/v.
16.	Overhauling inspection & assembling gauze glass.
17.	To fabricate & weld a pipe with given pipe length & flanges.
18.	To repair a leak in pipe by fitting a doubler.
19.	To make a pipe line with bends (welding).
20.	To dismantle, inspect & overhaul a hydraulic pp for deck crane.
21.	Practice of welding.
22.	Practice of Brazing & Soldering.
23.	Tracing of pipelines.
24.	Turning, cutting and similar operations by Lathe machine.

MARINE ENGINEERING DESIGN & DRAWING – I (MEDR - 510: 72 HRS

DETAILED SYLLABUS		
Procedure in Machine Design: Concepts of design, procedure & processes, Design synthesis, Economic consideration in design, Feasibility, Preliminary design alternative, Final design alternative, Preliminary and Final plans and drawings. Use of standards in design, selection of preferred sizes Common useful materials and manufacturing considerations in design. Properties of materials, BIS system of designation of steels. Review of failure criteria in mechanical design, Basis of good design. Failure of machine parts, deformation, wear corrosion.		
Machine Design: Strength consideration for design, strength of materials, reliability, influence of size, stress concentration, strength under combined stresses, static loads, impact loads, repeated loads, completely reversed loads, static plus alternating loads, cyclic and combined loads, fatigue strengths, dynamic stresses, selection of materials.		
Specifications: Fit, Tolerance, Finish – BIS, Design & drawing to specifications for parts subjected to direct loads. Fasteners, bolts and screws, cotter & knuckle joints, keys & couplings, pipe joints, riveted & welded joints. Design of welded machine parts. **Power transmission:** Shafts and axles, bearings, clutches & brakes, belt drives, design & drawing of tooth gearing like spur & bevel gears, rack & pinion, worm & worm wheels, helical gears etc.		
DRAWING: (Advanced marine machinery assembly drawing.**)**		
4 – stroke piston & rod		Plate type gauge glass

Syllabus for B.Tech(Marine Engineering) Second Year

Revised Syllabus of B.Tech in MRE (To be followed from the academic session, July 2011, i.e. for the students who were admitted in Academic Session 2010-2011)

Hydraulic steering gear		Turbine flexible coupling
Stern tube and tailshaft		Flow regulator
High lift safety valve		Air inlet valve
Full bore safety valve		Fuel valve - Quick closing valve

SIXTH SEMESTER

THEORY PAPERS

MARINE SHIP CONSTRUCTION (MSC - 601): 36 HRS

DETAIL SYLLABUS
Loading of Tonnage: Definition of free board and various assigning conditions, Loadline Surveys, tonnage regulations, calculation as per 1969 convention, details of markings permanently carved.
Shipyard Practice: Layout of shipyard, Mould loft, fabrication of assembly, sub assembly, units in construction, role of Surveyors in construction, role of Surveyors in construction of Ship; Keel laying, Launching, Seatrial.
Ship Types: Tankers, bulk carriers, container ships. LNG, LPG and chemical carries, Lash ships, Passenger ships, Dredger, Tugs etc.- Constructional details and requirements.
Offshore Technology: Drilling Ships and platforms, supply/ support Vessels-types and constructions, Dynamics Postioning, Deep Sea diving system, fire fighting arrangement, Cable laying vessels.
Ship Surveys: Survey rules, Functioning of ship classification Societies, Surveys during construction, Periodical surveys as per statutory regulations, retention/suspension of class of a ship, constructional features and rule guidelines for a merchant vessel as per Marpol regulations.
Statutory Certificates and their validity, Ships registration formalities, Intact Stability Criteria under damaged conditions (constructional point of view in compliance with statutory regulations), Enhanced Survey requirements, HSSC.

MARINE INTERNAL COMBUSTION ENGG - I (MICE - 602): 51 HRS

DETAILED SYLLABUS
Practical Diesel Engine Cycle: 4 stroke and 2-Stroke cycles; Deviation from ideal Condition in actual engines; Limitation in parameters, Timing Diagrams of 2-stroke and 4-stroke engines. General Descriptionof I.C. Engines; Marine Diesel Engine of M.A.N., sulzer, Doxford, B & W makes etc. Comparative study of slow speed, medium speed and high speed diesel engines – suitability and requirements for variouspurpose.
Constructional Details of I.C. Engines: Principal Components; Jackets and Liners, Cylinder heads. Pistons, Cross heads, Connecting rods, Bed plates. A-frames, Welded construction for Bed plates & frames, Tie rods.
Scavenging and Supercharging System: Scavenging arrangements in 2-stroke engines; Air charging and exhausting in 4-stroke engines; Various types of Scavenging in 2-stroke engines; Uniflow, loop, cross loop and reverse loop scavenging, their merits and demerits, Scavenge pumps for normally aspirated engines; under piston scavenging, Scavenge manifolds. Turbocharger and its details.
Supercharging arrangements : pulse and constant pressure type; Their relative merits and demerits in highly rated marine propulsion engines. Air movements inside the cylinders.

Combustion of fuels in I.C. Engines; Grades of suitable fuels, Preparation of fuels of efficient combustion. Fuel atomization and requirements of fuel injectors. Design aspects of combustion chamber.
Compression pressure ratio and its effect on engines. Reasons for variation in compression pressure and peak pressure, ignition delay, after burning.
Cooling of I.C. Engines: Various cooling media used; their merits and demerits, cooling of pistons, cylinder heads, coolant conveying mechanism and systems, maintenance of coolant and cooling system.
Safety and Prevention of mishaps in I.C. Engines: Causes and prevention of crank-case explosion, and Scavenge fires. Detection of same and safety fittings provided to prevent damage.
Special features of I.C. Engines :Development of long-stroke Engines, Implication of stroke-bore ratio, Development in materials in construction & heat treat in M.E. components.

FLUID MACHINES (MMF - 603) : 36 HRS

DETAILED SYLLABUS
Impact of Jet : Force exerted by a jet i) normal to a stationary or a moving flat vane; ii) inclined to a stationary or moving flat vane, iii) to a stationary or moving curved vane, Power of a jet.
Dimensional Analysis & Dynamical Similarity : Use of Dimensions for finding conversion factors; Dimensions of common quantities; Dimension equations; Method of finding dimensionless groups; Geometrical and dynamical similarity problems.
Reciprocating pumps: Various types, single and double acting, single and multi cylinder, co-efficient of discharge; theoretical indicator Diagrams; Effect of acceleration and friction; use of air vessel.
Centrifugal Pump: Calculations of Various heads; Losses and Efficiency. Work done per unit weight, Dimensions of Impellers; Velocity diagrams at inlet and exit; Calculation for power input; Torque on shafts; Cavitation in Centrifugal pumps, characteristics curves
Impulse and Reaction turbines: Pelton Wheel: Inward flow reaction turbine; Efficiency and vane angles, vane speed and head lost in runner, Specific speed; Applied problems.

MECHANICS OF MACHINES – II (MMOM - 604): 51 HRS

DETAILED SYLLABUS
Toothed gearing : Types of gears, condition for transmission of constant velocity; methods of avoiding interference; Transmission of power by gear trains on parallel shafts; Rack and pinion , Bevel gears, Worm and worm wheel, Spur gears Helical gears, Spiral gears; Epicylic gear trains.
Balancing: Balancing of masses rotation in different planes, dynamic forces at bearings; Primary and secondary balance of multi-cylinder in-line Engines and configurations.
Gyroscope: Gyroscopic couple. Vector representation to torque and angular movement, Steady rectangular precession, vector treatment; Steady conical precession; Motion involving steady precession; Application to Ship's stabilization.
Torsional Vibrations: Single rotor system, rotor at end and rotor in the middle. Effect of inertia of Shaft. Two rotor system, rotors at both ends and rotors at one end. Three rotor and multirotor system. Torsionally equivalent shafts, Geared system.
Forced Vibrations: Forced Linear and angular Vibrations, Periodic force transmitted to support, periodic movement of the support.
Transverse vibrations of beams: Single Concentrated load, effect of the mass of the beam, Energy method-several concentrated Loads uniformly distributed load, Dunkerley's empirical method for several Concentrated loads.

Whirling of shafts-Whirling of shafts, critical speed, effect to slope of the disc, effect of end thrust.
Damped vibrations: Idea of Viscous and Coulomb damping, Linear and angular vibrations with Viscous damping, Forced damped liner and angular Vibrations, Periodic movement of support.

MARINE STEAM ENGINEERING (MSE - 605): 72 HRS

DETAILED SYLLABUS
Marine Steam Turbines: Development in steam engines. Reciprocating engines to low pressure steam turbines and to high Superheat, Reheat and Regenerative plants. General principles of construction and design., Simple Impulse, Pressure compounded Impulse, pressure Compounded Impulse, Pressure Velocity Compounded Impulse, Parsons Axial flow reaction turbine, Double flow turbine. Radial flow Reaction turbine, Double Casing Turbine.
Layout of plants : General Layout and description of a modern geared Steam turbine installation including auxiliaries in marine use combined Gas Turbine & steam turbine circuits. Location of gears, Flexible Couplings and thrust Blocks. Steam Exhaust and Drain line system. Gland Steam System.
Selection of Materials: Materials used for various components like blades, rotors, gears, casing and sealing glands etc and their justification.
Constructional Details: Types of Blades & methods of fixing, Solid Built-up and Drum rotor for impulse and Reaction turbines, Casings for H.P & L.P. Impulse and reaction turbines, Diaphragms; nozzles and glands, Carbon glands and labyrinth packing glands, bearing and gears. All addendum gearing; Epicyclic gearing, Articulated type double reduction gearing for marine use. Reduction gears: Reduction ratio, type of gear teeth, gear construction, various arrangement of marine gearing, gear defects, flexible coupling, quill shaft.
Lubrication of Turbines : Suitable oil and their properties Film Lubrication, Forced Lubrication, Lubrication of main bearings and gears. Types of all oil jets. Emergency lubrication arrangements.
Condensers: Shapes and types of condensers, constructional details, location & method of securing, working principles, contraction and expansion allowances, leak test. Effect - change of temperature, circulating water quantity, change of main engine power, condenser surface.
Operation & Maintenance : Warming up procedure of main propulsion turbines, Ahead and Astern running. Control of Power and speed of propulsion. Throttle valve control & Nozzle control Governing. Self Closing emergency stop valve, Emergency governors, Condenser Vaccum Control, Servomotor governors for generators, Quick engaging turning for turbines.
Turbine Trials: Energy losses & heat balance methods of improving turbine efficiency. Emergency Operation of Turbines.
Alignment checking, Bridge & Poker Gauge, Allowance of expansion, Sliding foot, Adjustment of Thrust bearing, Energy losses and heat balance, methods of improving.

MARINE ELECTRICAL TECHNOLOGY - I(MEL - 703) : 36 HRS

DETAILED SYLLABUS
Power Generation and Distribution: Selection of D.C. & A.C. generators for use on ships with reference to its prime mover, Merits & Demerits of A.C. & D. C. on ships; Rules and Regulations governing electrical machinery on ships, Location & Installation of Generator sets. Rating and Characteristics of main switch boards. Arrangements of preferential trips & Protective devices with wiring diagrams. Rapid Voltage response of A.C. Generators. A.C. distribution on ships, regulations regarding layout of distribution system on general cargo ships and on Oil Tanker Navigation Lights and running light Indicator panel. Special requirements for lighting of deck & pump house of oil tankers. Wiring appliances.

Determination of Wire size for A.C. Power circuits. System earthing: Insulted Neutral systems. Resistance earthed system.
Motor & Control Equipments: Characteristics of continuous Maximum rated machines. Centralised control of Motors in machinery spaces. Classes of insulation-'A', 'B', & 'E' & temperature rise.
Starters for Miscellaneous electrical equipment for machinery space auxiliaries & centralized control of motors in machinery space. e.g. sequential starting and cut outs for an automatic fired boiler incorporating safety devices & combustion control equipment. Sequential starting for refrigerating plants, incorporating, safety devices like High Pressure cut out, Cooling water failure cut out Automatic defrosting with the help of timer. Special requirements of motors & starters for Anchor Windlass & Capstan, Wiring diagram, lowering & hoisting arrangements, Over load protection, magnetic disc, Brakes.

LABORATORY:

BOILER CHEMISTRY & FUEL OIL, LUBE OIL TESTING LABORATORY (MMBL - 607): 36 HRS

DETAILED SYLLABUS
To determine hardness content of the sample of boiler water in P.P.M. – in terms of $CaCo_3$
To determine Chloride content of the sample of water in P.P.M. in terms of $CaCo_3$
To determine alkalinity due to Phenolphthalein, Total Alkalinity and Caustic Alkalinity of the sample of water in P.P.M.
To determine Phosphate Content of the sample of water.
To determine dissolved oxygen Content of the sample of water.
To determine sulphate content of the given sample of water.
To determine Ph-Value of given sample of water.
Fuel Oil & L. Oil Testing Laboratory – To test for viscosity, Acidity, H_2O content, infestation, spectrometric & chromatographic analysis; pH testing of oil, carbon residue test, sludge test
To determine the percentage of CO_2, CO and Oxygen in the fuel gases.
To determine the Colorific valve of the fuel with the help of a Bomb Calorimeter.

MECHANICAL LAB- III (MMEL - 608): 36 HRS

Conduct any 8 (eight) of the following experiments:

1) To verify the relation experimentally $T = 2\pi\sqrt{\frac{I}{K}}$ and study the relationship between the periodical time and shaft length.

2) To find the co-efficient of friction both for flat belt and V-Belt with Belt friction apparatus.

3) To find out the natural frequency of a loaded heavy beam and to verify the Dunkerley's Rule.

4) To study of undamped natural vibrations of a beam pivoted at one end supported by tension spring at the other end.

5) To study of forced vibrations for various amounts of damping of beam pivoted at one end and supported by tension spring at the other end and to plot a graph of amplitude factor Vs frequency ratio. (LONG. VIB).

6) To study the forced vibrations for vibrations for various amounts of damping and a plot a graph of amplitude factor Vs frequency ratio (Lat. Vib.)

7) To find out the damping co-efficient 'Ct' for various depth of damping drum (immersed in oil) and to plot a graph of damping torque Vs. depth of damping drum.

8) To determine the hydraulic efficiency of Pelton turbine.

9) To determine the meter Constant of the Venturimeter.

10) To determine the co-efficient of velocity, Co-efficient of contraction and Co-efficient of discharge of water through the various orifices.

11) To determine the friction co-efficient for the flow of water through a pipe.

12) To determine 'GM' (Metacentric Height) to a floating body

MARINE WORK SHOP PRACTICAL (MWP – 609) :

DETAILED SYLLABUS
1. Dismantling, overhauling, inspection & assembling of a A/E cyl. Head.
2. Dismantling, overhauling, inspection & assembling of Cylinder liner, piston & piston ring.
3. Dismantling, overhauling, inspection & assembling of main bearing & bottom end bearing.
4. C/Shaft deflection & inspection of C/case.
5. Dismantling & overhauling of M/E exhaust valve.
6. Dismantling & overhauling of M/E cylinder head relief v/v, Air staring v/v.
7. Dismantling & overhauling of Turbochargers.
8. Working principles & demonstration of working of a hydraulic steering gear system, safety checks & routine inspection.
9. Detection of cracks & dealing with cracked pieces
10. To fabricate & weld a pipe with given pipe length & flanges.
11. To repair a leaks pipe by fitting a doubler.
12. To make a pipe line with bends (welding).
13. Practice of welding.
14. Practice of Brazing & Soldering.
15. Detection of cracks & dealing with cracked pieces
16. Tracing of pipelines.
17. Turning, cutting and similar operations by Lathe machine.
Using a simulator the Following experiments are to be performed
1. To start and stop the engine;
2. To change engine's load and speed;
3. To change ambient operating conditions;
4. To simulate engine faults in varying degrees;
5. To mix different simulations;
6. To watch engine operation parameters'
7. To watch functions inside the cylinder;

8. To simulate the engine sound which varies with speed;
9. To carry out maintenance and repairs;
10. To try out different maintenance strategies;
11. To print engine data;

7TH SEMESTER

THEORY PAPERS:

NAVAL ARCHITECTURE – I (MNAR - 701): 51 HRS

DETAILED SYLLABUS
Geometry of ship & hydrostatic calculation : Ships lines, Displacement Calculation, First and Second moment of area, Simpson's rules, application to area and volume, Trapezoidal rule, mean and mid-ordinate rue, Tchebycheff's rule and their applications, Tonnes per Cm. Immersion. Co-efficient of form, Wetted surface area, Similar figures. Centre of gravity, effect of addition and removal of masses, Effect of suspended mass.
Transverse Stability of Ships: Statical stability at small angles of heel, Calculation of B.M. Metacentric, Inclining experiment, Free surface effect, stability at large angles of heel, curves of statical stability, dynamical stability, angle of loll; stability of a wall sided ship.
Resistance & Power: Frictional, Residuary & Total resistance, Froude's Law of comparison, Effective power calculations, Ships correlation Factor (SCF), Admiralty co-efficient, Fuel Co-efficient and Fuel consumption. Effect of viscosity and application of ITTC formula.

MARINE INTERNAL COMBUSTION ENGINE – II (MICE - 702): 72 HRS

DETAILED SYLLABUS
Fuel pumps and metering devices: Jerk and Common rail systems; Fuel injection systems Helical groove and spill valve type fuel pumps. System for burning heavy oil in slow and medium sped marine engines.
Maneuvering Systems: Starting and reversing systems of different Marine Diesel engines with safety provisions.
Indicator diagrams; and power calculations: Construction details of indicator instrument. Significance of diagram Power Calculations, fault detection, simple draw cards and out of phase diagrams. Power balancing, Performance characteristic Curves, Test bed and Sea trials of diesel engines.
Lubrication Systems: Lubrication arrangement in diesel engines including Coolers & filters Cylinder, Lubrication, Liner wear mechanism and preventive measures, combinations of lubricating oil its effect and preventive measures.
Medium Speed Engines: Different types of medium speed marine Diesel engines, couplings, and reduction gears used in conjunction with medium speed Engine, development in exhaust valve design, V-type engine details.
Gas Turbines: general Constructional and Design features for marine plants, materials of construction, Heat exchangers and Reheat arrangements, Comparison of Free Piston engine gasifiers and conventional air-stream combustion chambers.

Automation in modern diesel engine Plants: Remote operation, Alarm and fail safe system, Governors and their basic functions. Constant speed and Over-speed governors. Constructional details and hunting of governor.
Maintenance of Diesel Engines: Inspection and replacement of various Component members such as Piston ring, Cylinder head, Liner, Bearings, Driving chain and gears etc. crankshaft deflection and alignment. Engine holding down arrangements, Trouble shooting in diesel engine.
Modern trends in development: Current Engines (Sulzer RTA, B&W CMC& SMC, SEMT Pielstik), Intelligent Engine (Camless concept), improvement in design for increased TBO. U.M.S. Operations of ships.

MARINE ELECTRICAL TECHNOLOGY & ELECTRICAL MEASUREMENTS (METM - 703): 72 HRS

DETAILED SYLLABUS
Essential equipment and special circuits- Classification society's requirements for electrical equipment for steering gears, electrical control from wheel house for electro-hydraulic steering gear, all electrical steering gear circuit and control equipment, navigation lights.
Miscellaneous marine equipment and alarm system-electrical engine room telegraph, remote indicating revolution counter, remote helm indicator, salinity indicators, mist detectors, carbon dioxide recorder, electrical equipment for water tight door operation, centralized alarm system in machinery space, for the above, fire alarm system for engine room, holds and accommodation, high temperature alarms low and high level alarm.
Electric propulsion –systems, difference and relative merits, alternating current, diesel electric and turbo electric propulsion system engines, generators, motors, excitation system and control.
Maintenance of electrical equipment-detection of faults and repair, preventive maintenance and periodic survey of equipment. Classification societies requirements for spares on board.
Basic requirements of a measuring instrument-deflection, control and damping devices moving coil, moving iron, dynamometer and thermocouple type of ammeter, voltmeter and their construction and other details, extension of scales of a meter.
Single phase and three phase measurements by wattmeter. Measurement of energy. Measurement of speed, frequency and phase difference. Measurement of resistance, inductance and capacitance by Bridge Method. Magnetic measurement. Localization of cable faults. Transducers and its application in the measurement of pressure, flow, temperature etc Simple electronics measuring devices, such as VTVM, CRO, IC tester, signal generator.

SSEP, SAFE WATCH KEEPING & PERSONAL CARE -I (MSSEP -704): 54 HRS

Precautions against fire and explosions, fire prevention, detections and extinction in all parts of a ship, & personal Survival Techniques and life saving appliances in ship. Medical Care.

Ship fire prevention & control Fire hazard aboard ships: Fire triangle, Spontaneous Combustion. Limits of inflammability, Advantages of various fire extinguishing agents including vaporizing fluids and their suitability for ship's use. Control of Class A, B and C fires.
Fire protection built in the ships: SOLAS convention, requirements in respect of materials of construction and design of ships, fire detection and extinction systems, escape means, electrical installations, ventilation system and venting system for tankers. Statutory requirements for fire fighting systems and equipments on different vessels.
Detection and Safety Systems: Fire Safety precautions on cargo ships and tankers during working. Types of detectors, Selection of fire detectors and alarm systems and their operational limits. Commissioning and periodic testing of sensors and detection system. Description of various systems fitted on ships.
Fire Fighting Equipment: Fire pumps, hydrants and hoses, Couplings, nozzles and international shore connection, Construction, operation and merits of different types of portable, non-portable and fixed fire extinguishers for ships. Properties of Chemicals used. Bulk Carbon Di-Oxide and inertgas systems. Fireman's outfit, its use and care. Maintenance, testing and recharging of appliances. Preparation, Fire appliance Survey.
Fire control: Action required and practical techniques adopted for extinguishing fires in accommodation, machinery spaces, boiler rooms, Cargo holds, galley etc. fire fighting in port and dry dock. Procedure for re-entry after putting off fire. Rescue operations from affected compartments. First aid, fire organization on ships. Fire signal and muster. fire drill. Leadership and duties.
Prevention of pollution of Marine Environment:- (i) While bunkering, loading & discharging oil cargo, tank cleaning, pumping out bilges. (ii) Knowledge of construction and operation of oil pollution prevention equipment in Engine room & on tankers. (iii) MARPOL 73/78 and other national legislations like OPA-90. (iv) MARPOL equipments like ODMCS, OWS, incriminators etc. (v) Oil record book and SOPEP manual.

SHIP OPERATION AND MANAGEMENT (MSOM – 705): 54 HRS

DETAILED SYLLABUS
Brief history of shipping: Modern shipping practice. Marine vehicles and cargoes. Development in Shipping and cargo handling Principal shipping organizations. Liner and tramp shipping services, Conference systems. Chartering, Charter parties. Theory of freight rates and fares. Rate fixation machinery and government control. Bills of lading. Carriage of goods by sea act. Cargo Surveys and protests.
Role of classification society
Marine Insurance: Underwriting and loss adjusting principles applied to Marine cargo insurance. Hull policy, particular average General average, P & I Clubs.
Ownerships of vessels, Shipping Company and its administration. Capitalization and finance, Economics of new and second hand tonnage. Subsidies.
Ship Operations: Planning sailing schedules. Voyage estimates Economic factors.
Commercial Shipping Practice. Manning of ships. Engagement and disadvantage of crew D. L. B. Seaman's welfare.

Merchant Shipping act: Registration of ship. Ship's papers. Port Procedures. Pilotage, Duties regarding pollution. Collision, Explosion fire etc. Vessels in distress. Shipping casualties' penalties under Merchant Shipping Act.

ELECTIVE (MOPT - 706): 54 HRS

ELECTIVE – A: Advanced Marine Heat Engines (Co-cycles) (MOPT – 706A)

DETAILED SYLLABUS
Complex Heat Engine Plants :- Combined Steam Turbine and diesel Engine Cycles, Combined steam Turbine and Gas Turbine Cycles. Combined Gas Turbine and Diesel Engine cycles/plants. Different Methods of Improving the Overall Thermal Efficiency of the entire plant. Design of the most optimum condition and combination of complex plants. Free piston Gas Generators. **Turbo Blowers and Turbo Compressors :-** Compressor Characteristics for Axial Flow compressors and Centrifugal compressors. Turbine characteristics. Matching of components like compressor and turbine. Performance of different units in combination in single shaft arrangement. **Combustion and Flame Stabilization :-** Combustion of liquid fuels, Atomization, mixing, combustion curve and different methods of Flame Stabilization, Design & combustion Chamber. Spray of fuel. Pre-mixing of Gaseous Fuels for combustion. Stability of the Flame. Design of different types of compact Heat Exchangers for different Applications, E.G. Air Pre-heater, Gas and oil Heaters etc.

ELECTIVE – B: Advanced Fluid Mechanics (MOPT – 706B)

DETAILED SYLLABUS
Hydraulic pumps :- Gear, Screw, Vane pumps of Fixed and variable displacement types, Axial piston pumps of fixed and variable displacement types Swasplate and Bent Axis Design; Radial piston pump.
Hydraulic Accumulators :- Various type-weight, spring or gas pressure loaded, different principles piston, bladder or diaphragm type. Change of condition of the fluid in a loaded accumulator-Adiabatic, Isothermal. Polytropic. Flow graph, sizing, Pressure setting and the economics.
Hydraulic Rotary Motors :- Fixed or Variable displacement type, Axial piston unit of Swashplate and bent axis design, fixed displacement axial unit of wobble plate design, Vane type.

Hydraulic Transmission of Power : - Fluid Coupling, Hydraulic Torque Converter and their characteristics, Hydraulic Rotary Actuator of parallel piston type and piston type with rack pinion. Crank lever mechanism.

ELECTIVE – C: Renewable Energy Sources & Applications (MOPT – 706C)

DETAILED SYLLABUS
Principle of Renewable Energy: Introduction, Fundamentals, Scientific Principles of Renewable Energy. Technical Implications. Social Implications.
Solar Radiation: Introduction, Extra terrestrial Solar Radiation. Components of Radiation. Geometry of Earth & Sun. Geometry of the Collector. Solar Beam. Effects of Eastern Atmosphere. Measurement. Examination of Solar Radiation. Problems.
Solar Water Heating: Introduction, Heat Balance. Unsheltered & Sheltered Heaters, Systems with Separate storage. Selective Surfaces, Evacuated collectors. Uses of Solar Heat. Air Heater. Space Heating & Cooling. Water Desalination. Solar Ponds. Solar Concentrators Electrical Power systems. Problems.
Photo Voltaic Generation: Silicon P-N Junction. Photo absorption. Solar Radiation Input. Photo Voltaic Circuit Properties & Loads. Limit to cell efficiency. Solar Cell Photo voltaic & thermoelectric generation. Associated problems.
Wind Power: Introduction, Turbine Types & Terms. Linear Momentum & Basic Theory. Dynamic Matching. Steam Tube Theory, Characteristics of the Wing. Power Extraction by /turbine, Electricity Generation. Mechanical Power. Total Systems. Problems.
Wave Energy: Introduction, Wave Motion, Wave Energy & Power. Wave Patterns. Devices Problems.
Tidal Power: Introduction. The cause of Tides. Enhancement of Tides, Tidal Flow Power. Tidal Tange Power. World Range Power sites. Problems. Ocean Thermal Energy Convention : Principles. Heat Exchangers. Pumping Requirements. Other practical considerations. Problems. Hydro power & Geothermal Energy.
Brief Review & Description on Energy Storage & Distribution: Importance of Energy Storage & Distribution. Biological Storage. Chemical Storage. Heat storage. Electrical Storage. Fuel Cells. Mechanical Storage. Distribution of Energy Problems.

ELECTIVE – D: Bio Mass (MOPT – 706D)

DETAILED SYLLABUS
Principles of using Biomass Availability. Economics. Biofuels: Introduction, Biofuel Classification, Thermo chemical, Biochemical. Agrochemical.
Biomass Production for energy farming. Energy farming advantages & disadvantages. Geographical Distribution. Crop Yield. Energy analysis. Direct combustion for heat. Domestic cooling & heating, Crop drying Process heat & electricity.
Pyrolysis, Solid, Liquid, Gases: Hydrogen Reduction. Acid & enzyme hydrolysis. Conversion of oil (coco) to Ester, Methanol liquid fuel Alcoholic fermentation. Directly from sugar cane sugar Beet. Starch crops, Cellulose. Ethanol fuel use. Ethanol production.
Anaerobic Digestion for Biogas-Basic process & energetics Digester sizing. Working Digesters. Agrochemical fuel Extraction advantages & disadvantages.

ELECTIVE – E: EMI & EMC (MOPT – 706E)

DETAILED SYLLABUS
Introduction to causes of EMI Sources of conducted interference and its characteristics. a) Non-Functional Sources (b) Functional Sources of EMI Characteristics of Interference a) Bandwidth (b) Amplitude behaviour c) Waveform (d) Occurrence Design practice for minimizing conducted Interference Sources of Radiated Interference and its characteristics Nature of sources of Radiated Interference. a) Non-functional sources (b) Functional sources c) Electromagnetic Pulse (d0 Design Practice Interference coupling by conduction and radiation. a) Coupling via conducting path b) Radiation coupling c) Radiation coupling d) Design practice Grounding and Bounding Shielding a) Capable and Connector Shielding Filtering a) Filter Design (b) Transient Suppression

c) Power Line Filters (d) Materials and special devices Mathematical Model a) Source Model (b) Coupling Model c) Suscepter Model EMC Specification a) Military standards and specification b) Industrial and Government specification EMC Test Plans and Procedures a) Measurement methods for Field strength and for conducted Interference.

LABORATORIES:

POWER PLANT LAB (MPPL – 707): 54 HRS

DETAILED SYLLABUS
Running of Diesel Engine (Coupled to Alternator): Methods of starting, running under different load conditions (load on the alternators), Watch keeping & recording of the temperatures, pressures on Different meters on the diesel engine instrument panel and Switch Board. Looking after the auxiliary machinery viz. Air compressor, Cooling water pump and Lub. Oil pump.
Boiler Operation : i) Smoke Tube Boiler raising steam from cold condition upto its working pressure and maintaining the same while operating the Reciprocating engine and the auxiliary machinery, maintenance schedule for the Boiler. Blowing of gauge glasses with precautions involved Necessity and procedure of cross Blowing. Overhauling of mountings. Dismantling, overhauling and adjustment of high lift Safety Valve, Studying the working of Boiler Plant auxiliary machinery. ii) To study the operation of the water tube boiler. Firing from cold condition, raising steam upto its working pressure and to maintain the same while operating the Steam Turbines and the auxiliary machinery, precautions involved during firing of boiler, Operation of steam superheater, water level indicators, high and low level alarms and other boiler mountings, Overhauling and adjusting of safety valves. Recording and controlling of various pressure & temp on the Instrument panel. Care of Boiler auxiliaries, feed water system and fuel system.
Running of Steam Turbine: Warming up of the engine, Lubrication of moving parts and precautions involved. Starting of the engine. Reversing procedure. Running the engine at full power and taking Indicator Cards. 'Linking out' and 'linking in' of the three Cylinders adjusting the 'cut off' period of the engine and studying the effect.

ELECTRICAL MEASUREMENT LABORATORY (MEML - 708): 36 HRS

DETAILED SYLLABUS
To use wattmeter for single phase & three phase measurements
Measurement of energy

To determine a) the speed of high speed machines b) Frequency c) Phase difference.
Use of Bridge method to measure resistance, inductance & capacitances.
To study E.R./ Bridge telegraph ckt.
To determine & isolate different faults in ckts.
To use transducers for measurements of flow, temperature, pressure etc.
To study simulated conditions for ckts. Like shaft generator etc,
To study of Impressed current cathodic protection as applied to ships.

FIRE CONTROL LABORATORY (MFCL - 709): 54 HRS

DETAILED SYLLABUS
Testing and operation on Jet and spray type nozzles and fire hoses. Operation, charging and maintenance of portable fire extinguishers (a) Soda acid type (b) Foam type (c) Dry power type
Operation, use and functions of Breathing apparatus.
(a) Self contained type (b) Bellow type
Use of fireman's outfit.
Construction and operational details of life raft giving importance to manual and hydrostatic device.
Study of total flooding system with alarms & cut out arrangements.
Study of sprinkle system & foam system use of foam applications.
Smoke & fire detecting units.
Practical demonstration and participation of extinguishing actual fire.

SESSIONAL:

MARINE MACHINERY SYSTEM DESIGN & DRAWING (MMSD - 791): 108 HRS

DETAILED SYLLABUS

Syllabus for B.Tech(Marine Engineering) Second Year

Revised Syllabus of B.Tech in MRE (To be followed from the academic session, July 2011, i.e. for the students who were admitted in Academic Session 2010-2011)

Advanced Design of Marine Systems : Design and Drawing of Water cooling systems including Pumps, filters, Heat exchangers for diesel and Steam engine plants. Lubricating Oil systems including Pumps, Purifiers Pressure bypass valves. Electro-hydraulic Steering gear system including Rudder, Rudder stock, Tiller arm & rams etc. Marine Diesel Engine Air starting systems including air receivers, Compressors and Air starting valves. Marine Diesel Engine Scavenge and Exhaust system. Marine Diesel Engine fuel Injection system including Fuel pumps and Fuel- injectors. Power Transmission system including Thrust Blocks, Intermediate shaft and Tail-End shaft.
Computer Aided Design: Analysis of stress ,strain, vibration ,thermal stress, deflection through method of Finite Element Analysis by use of various software

EIGHTH SEMESTER

THEORY PAPERS:

SSEP, SAFE WATCH KEEPING & PERSONAL CARE – II (MSSEP - 801): 54 HRS

DETAILED SYLLABUS	
a)	Legislation:-
(i)	National & International legislation.
(ii)	IMO & Conventions
(iii)	Indian Merchant Shipping Acts & Rules.
(iv)	Classification societies.
(v)	Statutory survey & Certification
(vi)	Port State control & flag state inspection
(vii)	ISM, SMC & ISO Codes.

b) STCW Convention & Safe Watch-keeping – Standards of Training, certification & Watch-keeping for sea farers-International Conference of 1978. Basic Principles to be observed in keeping an engineering watch. Criteria for composing the engine room watch. Operation & Watch requirements. Fitness for duty. Protection for marine environment. Requirement for certification; minimum knowledge requirement for certification-theoretical, practical; duties & responsibilities concerning safety & protection of environment. Requirements for watch keeping duties. Physical training & experience in watch-keeping routine; Main and aux, machines, pumping systems, Generating plant, Safety and emergency procedures. First aid.
Minimum requirement for Ratings of Engine Room watch. Special requirement for engineer officer for Oil Tankers, Chemical Tankers and Gas Tankers. Details of operational guidance for In-charge of an engineering watch.
Engineering watch (underway)- General, Taking over watch, Periodic checks of machinery, Engine Room Log, Preventive repair and maintenance; Bridge notification. Navigation in congested water and during restricted visibility, calling the attention of the Chief Engineer Officer, Watch keeping personnel.
Engineering Watch (Unsheltered anchorage)- Conditions to be ensured. Watch-keeping (in Port)- Watch arrangements; Taking over the watch; Keeping a watch. Oil, Chemical & Gas Tankers-Principles, characteristics of Cargo; Toxicity hazards; Safety equipments; Protection of Personnels; Pollutions.
Shipboard Applications-Regulations & Codes of Practice; Ship design & equipment of oil, chemical & Gas Tankers; ship Operation, repair & maintenance; emergency operations; training of other personnels. Requirement of continued up-dating of proficiency. Modifications of STCW vide june'95 Conference.
Introduction & Safety, Emergency situations, principles of survival, use of survival equipment, survival craft and rescue boat. Methods of helicopter rescue, launching arrangements, life boat engines and accessories, Evacuation, Signaling equipment and pyrotechnics etc.
First Aid, radio Equipment, launching and handling of survival craft in rough weather, understanding practical applications of medical guides, process of radio medical advices. Knowledge of actions to be taken in case of accidents or illness those are likely to occur on board ships.
Personal Safety & social Responsibility – Different aspects of personal relationships on board.

NAVAL ARCHITECTURE - II (MNAR – 802): 54 HRS

DETAILED SYLLABUS
Longitudinal Stability and tirm: Longitudinal BM, Moment to change trim one Cm. Change of trim, change of L.C.B. with change of trim, Change of trim due to adding or deducting weights, alteration of draft due to change in density, Flooding calculations, Floodable length curves, M.O.T. method for determination of floodable lengths, factors of subdivision, Loss of stability due to grounding, Docking stability. Pressure on chocks.
Strength of Ships : Curves of buoyancy and weight, curves of load, Shearing force and bending moments, Alternate methods, standard Conditions, Balancing Ship on wave, Approximation of max, shearing force and bending moment, method of estimating B.M. & Deflection. Longitudinal Strength, Moment of Inertia of Section Modulus.

Propulsion & Propellers ; Definitions, apparent and real ship wake, thrust, relation between power, relation between mean pressure and speed, measurement of pitch, cavitation, propeller types, fixedpitch, Variable Pitch, ring propeller, Kort nozzles, Voith Schneider propeller, theory, Blade element theory, Law of similitude and model tests with propellers, propulsion test, Geometry and geometrical properties of screw propellers, ship model correlation ship trials.
Rudder Theory: Action of the Rudder in turning a ship, force on rudder, Torque on stock, calculation of force torque on non-rectangular rudder, angle of heel due to force torque on rudder, Angle of heel when turning. Types of rudder, model experiments and turning trials, Area and shape of rudder, position of rudder, stern rudder Bow rudders.
Motion of ship on waves: Theory of waves, Trochoidal waves, relationship between line of orbit centres and the undisturbed surface, Sinusoidal waves. Irregular wave pattern, Wave spectra, Wave amplitudes, Rolling in unresisting media, rolling in resisting media, practical aspects of rolling, Antirolling devices, Forces caused by rolling and pitching, Heaving and Yawing.

MARINE ADVANCED THERMAL ENGINEERING (MATE - 803): 54 HRS

DETAILED SYLLABUS
Gas Turbine Plants: Constant volumes or Explosion Cycle Gas Turbine plant, constant pressure cycle or Joule – Brayton cycle Gas turbine plant simple C-B-T cycle, condition maximum work output and thermal efficiency in simple cycle, Methods of improvement of Thermal Efficiency and work ratio of Gas Turbine plants. C-B-T-H cycle, complex cycles, open & closed cycle operation of Gas turbine plants, its merits and demerits. Total head or stagnation conditions.
Axial Flow Compressor: Principle of centrifugal compression and pressure rise in a centrifugal compressor change in Angular Momentum. Pre-whirl and Pre-whirl vanes. Mach number at inlet to a centrifugal compressor.
Marine Refrigerating and A.C. Plants: Typical marine Refrigeration plants with multiple compression and evaporator system. Heat pump cycles, refrigeration in liquefied Gas carriers. Applied problems, Principle of Air conditioning, psychrometric properties of air at comfort conditions, control of humidity, air flow and A.C. capacity, Calculation for ship plants.

CONTROL ENGINEERING & AUTOMATION (MCEA - 804): 72 HRS

DETAILED SYLLABUS
Control System: Introduction to control terms, Block diagrams for control systems, open loop and closed loop feed back control, comparison of closed loop and open loop, Feed forward control. Feed forward modification. Regulators and Servomechanism. Proportional plus integral plus derivative controls, use of various control modes.
Graphical Representation of Signals: Inputs of Step Ramp sinusoid, Pulse and Impulse, Exponential Function etc. Error Detector, Controller output elements. The Dynamics of a simple servo-mechanism for Angular Position Control: The Torque Proportional to Error, Servomechanism, Different response of servomechanism. Technique for improving the general performance of servomechanism. The frequency response test. Series compensation using Nyquist Diagram. Parallel compensation using the Inverse Nyquist Diagram.
Process Control Systems: Automatic Closed loop process. Control system Dynamic characteristic of Processes. Dynamic characteristic of

controllers. Practical pneumatic controllers. Electronic Instrumentation for measurement and control.
Analog Computing and Simulation: Introduction, Basic concepts. Analog computers. Simulation. The use of Digital computer in the simulation control system. Hybrid Computers.
Transmission: Pneumatic and electric transmission, suitability for marine use. Pneumatic and types of Controllers hydraulic, electric and electronic controllers for generation of control action. Time Function controllers.
Correcting Units: Diaphragm actuators, Valve-positioners, piston actuators, Electro-pneumatic transducers. Electro-hydraulic actuators and Electric actuator control valves.
Application of Controls on Ships: Marine Boiler-Automatic combustion control, Air/fuel ratio control feed water control single two and three element type, steam pressure control, combustion chamber pressure control, fuel oil temperature control, Control in Main Machinery units for Temperature of lubricating oil, jacket cooling water, fuel valve cooling water, piston cooling water and scavenge air, fuel oil viscosity control Bridge control of main machinery. Instrument for UMS classification.

LABORATORIES:

CONTROL & SIMULATOR LAB (MCTR - 806): 72 HRS

DETAILED SYLLABUS
Description of basic engine functions and their simulation study of Engine running under simulated conditions.
Manual method of engine operation from engine room station. Engine Operation from Remote stations -i.e. engine control room and navigation bridge.
Safety and interlocks in UMS-ships and effect of malfunction of main engine auxiliaries. Electronic logic circuits in remote control stations.
Simulation of engine functions in logic circuits. Study and adjustments of logic circuits for remote control operation of main engine and trouble shooting. Interfacing Input/Output interfacing and pneumatic interfacing in the system. Role of classification societies with reference to UMS-ships.
Control Lab. Experiments. Operation of Automatic controller and maintaining a specific viscosity of given fuel. Operation of automatic flow controller and measuring the flow from in a given pipe. Operation and utility of a 3 Term (P + I + D) Pneumatic controller. To study the functioning of a Mist Detector and checking the alarm when the Pre-set value is exceeded. Study the operation of fire detection unit using lonization chamber type detector.

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