ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

MECHANICAL ENGINEERING (ME)

Semester V/ ME / B.TECH

Sl.No.	Sub Code	Subject	Hrs/week			Credits
			L	T	P	C
Theory						
1	ME131501	Basic Machine Design	3	2	0	4
2	ME131502	Material Science	3	2	0	4
3	ME131503	Fluid Mechanics-II	3	2	0	4
4	ME131504	Internal Combustion Engines	3	2	0	4
5	ME131505	Heat Transfer-I	3	2	0	4
6	HS131506	Principles of Management	2	0	0	2
Practical						
7	ME131512	Material Testing Lab	0	0	2	1
8	ME131514	Internal Combustion Engines Lab	0	0	2	1
9	ME131515	Heat Transfer-I Lab	0	0	2	1
Total			17	10	6	**25**
Total Contact Hours : 33						
Total Credit : **25**						

Course Title : BASIC MACHINE DESIGN
Course Code: ME131501
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 = 48

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**FUNDAMENTALS OF DESIGN**	Design Process - Computer aided design - Optimum design - Mechanical properties of materials - Types of loads- Stresses - Static, varying, thermal, impact and residual - Factors of safety - Theories of failure – Stress concentration factors.	10
2	**MECHANICAL SYSTEMS AND MANUFACTURING CONSIDERATIONS IN DESIGN**	Determination of power capacity - Torque levels - Efficiency of various transmission elements – Preferred numbers - Fits and tolerances - Surface finish - Standards.	10
3	**DESIGN OF FASTENERS AND JOINTS**	Screwed fasteners - Design of Pin joints - Design of welded joints. Riveted joints.	10
4	**DESIGN OF BASIC MACHINE ELEMENTS**	Design of shafts - keys - splines coupling - journal bearings - crank shafts - connecting rods - pistons – flywheels - selection of antifriction bearings.	10
5	**DESIGN OF SPRINGS**	Design of Helical springs - Compression and tension - Concentric torsion springs - Belleville springs – Leaf springs.	8
		TOTAL	**48**

REFERENCE BOOKS:

1. V.B. Bhandari, " Design of Machine Elements ", Tata McGraw Hill Publishing Company Ltd.,Joseph
2. R.L. Norton, Machine Design, Pearson
3. Edward Shigley and Charles R.Mischke, " Mechanical Engineering Design ", McGraw-Hill International Edition

Course Title : MATERIAL SCIENCE
Course Code: ME131502
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 = 48

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**CLASSIFICATION OF ENGINEERING MATERIALS**	Engineering properties of materials. Characteristic property of metals, bonding in solids, primary bonds like ionic, covalent and metallic bond, crystal systems, common crystal structure of metals, representations of planes and directions in crystals, atomic packing in crystals, calculation of packing density, voids in common crystal structures and imperfections crystals. Concept of plastic deformation of metals, critical resolve shear stress, dislocation theory, deformation by slip and twin, plastic deformation in polycrystalline metals, yield point phenomenon and related effects, concept of cold working preferred orientation. Annealing; recovery; recrystalization and grain growth; hot working.	18
2	**CONCEPT OF ALLOY FORMATION**	Types of alloys, solid solutions, factors governing solids solubility viz. size factor, valency factor, crystal structure factor and chemical affinity factor; order-disorder transformation. Binary phase diagrams (a) Isomorphism system, (b) Eutectic system, (c) Peritectic system, (d) Eutectoid system and (e)Peritectoid system. Allotropic transformation. Lever rule and its application, Interpretation of solidification behaviors and microstructure of different alloys belonging to those systems, Effect of non-equilibrium cooling, coring and homogenization. Iron-cementite and iron-graphite phase diagrams, microstructure and properties of different alloys (alloy steels; stainless steel, tool steel, HSS, high strength low alloy steel) types of cast iron, their microstructures and typical uses. Specification of steel. T.T.T. diagram: concept of heat treatment of steels i.e. annealing, normalizing, hardening and tempering; microstructural effects brought about by these processes and their influences on mechanical properties; factor affecting hardenability.	18

3	**OPTICAL PROPERTIES OF MATERIALS**	Scattering, Refraction, Theory of Refraction and absorption, Atomic Theory of optical properties. Lasers, Optical fibres- Principle, structure, application of optical fibres. Plastic: Thermosetting and thermoplastics. Ceramics: Types, structure, Mechanical properties, application Composite Materials: Agglomerated Materials: Cermets. Reinforced Materials: Reinforced Concrete. Glass fiber reinforced plastics, Carbon fibre reinforced plastics, fibre reinforced plastics, Laminated plastic sheets. Tefnol, Properties of composites, Metal matrix composites, manufacturing procedure for fiber reinforced composite. Introduction to Nano-materials.	12
		TOTAL	**48**

REFERENCE BOOKS:

1. Material Science and Engineering by Raghavan, PHI
2. Materials Science and Engineering by Balasubramaniam, Wiley
3. Materials Science and Engineering by W.D.Callister, Wiley and Sons Inc
4. Elements of Material Science and Engineering by Lawrence H. Van Vlack, Pearson
5. Introduction to Physical Metallurgy by Avner, Tata McGraw Hill

Course Title : FLUID MECHANICS-II
Course Code: ME131503
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 = 48

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**COMPRESSIBLE FLOW**	Speed of propagation of a small disturbance through a compressible fluid, sonic velocity, Mach number, mach cone and Mach wave; isentropic flow, stagnation properties of a compressible flow, isentropic pressure, temperature and density ratios; compressibility correction factor in the measurement of air speed; area – velocity relationship for compressible flow through a variable area duct, mass flow rate through a duct, critical condition and choking; flow through convergent-divergent nozzle.	12
2	**ANALYSIS OF FLOW THROUGH PROPELLERS AND WINDMILLS**	Slip stream theory, actuated disc theory; jet propulsion devices – analysis of thrust and other performance parameters.	6
3	**SIMILARITY AND MODEL STUDY IN TURBOMACHINES**	Dimensional analysis of incompressible flow turbomachines, flow coefficient, head coefficient and power coefficient; non-dimensional plot of performance curves; specific speed; Cordier diagram; specific speed as a design parameter of imcompressible flow turbomachines; unit quantities for hydroturbines.	10
4	**MECHANICAL, HYDRAULIC AND VOLUMETRIC LOSS IN A TURBO-PUMP**	Different types of losses in a hydroturbine installation; different efficiencies in turbomachines.	4
5	**INTERACTION OF A TURBOMACHINE WITH THE PIPELINE SYSTEM**	System head curve and point of operation, surging, series and parallel operation of pumps and fans.	8
6	**TESTING OF HYDROTURBINES**	Different performance characteristics of hydroturbines like operating characteristics, main characteristics, Muschel curves; speed governing of hydroturbines – different methods.	8
		TOTAL	**48**

REFERENCE BOOKS:

1. Massey, Mechanics of Fluids, Taylor & Francis.
2. M.M. Das, Fluid mechanics and turbo machines, PHI.

3. S.K. Som & G. Biswas, Introduction to Fluid Mechanics & Fluid Machines, TMH.
4. Fox &Mcdonald, Introduction to Fluid Mechanics, Wiley.
5. Bansal, Fluid Mechanics and Machinery, Laxmi.
6. C.S.P. Ojha, R. Berndtsson, P.N. Chandramouli, Fluid Mechanics & Machinery, Oxford University Press.
7. K. Subramanya, Fluid Mechanics & Hydraulic Machines, TMH.
8. Potter &Wiggert, Fluid Mechanics, Cengage Learning.
   S. Pati, Fluid Mechanics and Machinery, TMH.

Course Title : INTERNAL COMBUSTION ENGINES
Course Code: ME131504
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 = 48

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**CLASSIFICATION AND WORKING OF BASIC ENGINE TYPES**	2-stroke, 4- stroke, C.I., S.I., etc.	3
2	**ANALYSIS OF AIR STANDARD CYCLES**	Fuel- air cycles and actual cycles.	3
3	**FUELS**	Classification and desirable characteristics of I.C. engine fuels, Rating of S.I. and C.I. engine fuels, Alternative fuels (liquid, gaseous, etc.), Analysis of combustion product, HCV and LCV of the fuels.	6
4	**COMBUSTION OF FUELS**	Combustion of fuels in I.C. engines, Combustion in S.I and C.I engines, Parameter influencing combustion, Detonation and knocking in S.I. and C.I. engines and their preventions, Combustion chamber types, Basic principles of combustion chamber in I.C. engines.	8
5	**FUEL - AIR MIXING IN S.I. ENGINES**	Working principle of a carburetor, Analysis of simple carburetor, Mechanical and electronic fuel injection system and their control in S.I. engines. Basic principles of MPFI in SI engines.	6
6	**FUEL-OIL INJECTION IN C.I. ENGINES**	Fuel injection systems, Working principles, Injection pumps and nozzles.	5
7	**IGNITION**	Ignition systems in I.C. engines (Battery, magneto and electronic), ignition timing and spark advance.	3
8	**SUPERCHARGING AND SCAVENGING OF I.C. ENGINES**	Supercharging limits, Turbo charging, Scavenging - ideal and actual, scavenging parameters, and scavenging pumps.	3
9	**PRINCIPLES OF LUBRICATION IN I.C. ENGINES**	Properties of lubricating oil.	2

10	**AIR AND LIQUID COOLING OF I.C. ENGINES**	Principles and systems.	2
11	**PERFORMANCE AND TESTING OF I.C. ENGINES**	Measurement of speed, torque, fuel consumption, determination of IHP, BHP and FHP, specific fuel consumption, determination of indicated thermal efficiency, brake thermal efficiency and mechanical efficiency, plot of efficiency vs. speed curves.	5
12	**POLLUTION CONTROL OF EMISSIONS OF I.C. ENGINES**	Pollution control of emissions of I.C. engines.	2
		TOTAL	**48**

REFERENCE BOOKS:

1. V. Ganesan, Internal Combustion Engines, The McGraw-Hill Companies.
2. M.L. Mathur and R.P. Sharma, A course in Internal Combustion Engines, Dhanpat Rai & Sons.
3. H.N. Gupta, Fundamentals of Internal Combustion Engines, PHI Learning Private Ltd. University Press.

Course Title : HEAT TRANSFER-I
Course Code: ME131505
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 = 48

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**CONDUCTION**	**INTRODUCTION:** Concept of modes of Heat Transfer, conduction heat transfer. General 3-D differential equation for heat conduction, Boundary conditions and their types.	12
2	**ONE DIMENTIONAL STEADY STATE HEAT CONDUCTION** **ONE DIMENTIONAL UNSTEADY STATE HEAT CONDUCTION**	System with or without heat generation: slab, cylinder, sphere, Concept of thermal resistance and electrical analogy, Variable thermal resistance and electrical analogy, Composite systems: slab, co-axial cylinder, concentric sphere, Critical radius of insulation, Fins. Lumped system analysis, Response time of a temperature measuring instrument, Mixed boundary condition.	12
3	**CONVECTIVE HEAT TRANSFER**	Dimensional analysis, boundary layer concept, basic governing equations, laminar and turbulent external and internal flows, forced and free convections, integral methods, semi-empirical correlations, flow over bank of tubes.	12
4	**HEAT EXCHANGER ANALYSIS & DESIGN**	Types; Overall heat transfer co-efficient. Fouling factor, LMTD methods of analysis, Effectiveness – NTU method. Pressure drop and pumping power, Aspects of design, double pipe heat exchanger; Shell and tube heat exchanger; Condensers, Optimization of heat exchangers.	12
		TOTAL	**48**

REFERENCE BOOKS:

1. Heat Transfer by J P Holman, Souvik Bhattacharyya, Tata Mcgraw Hill
2. Heat and Mass Transfer by Yunus A. Cengel, Tata Mcgraw Hill
3. Heat Transfer by Y V C Rao, University Press
4. Heat and Mass Transfer by P K Nag, Tata Mcgraw Hill

Course Title : PRINCIPLES OF MANAGEMENT
Course Code: HS131506
L-T-P-C: 2-0-0-2

Class Hours/week	2
Expected weeks	12
Total hrs. of classes	24

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**MANAGEMENT**	Definition, nature, importance, evolution of management thoughts – pre & post scientific era, contributions made by Taylor, Fayol, Gilbreth, Elton Mayo, McGregor, Maslow – covering Time & Motion Study, Hawthrone Experiments; Is management a science or art? Functions of manager, ethics in managing and social responsibility of managers.	4
2	**PLANNING & CONTROL**	Why Management process starts with planning, steps in planning, planning premises, types of planning, barriers to effective planning, operational plan, strategic planning, Mckinsey's 7's Approach, SWOT analysis, Controlling-concept, Planning- control relationship, process of control, human response to control, dimension of control, MBO.	4
3	**DECISION MAKING & ORGANIZING**	Nature, process of decision making, decision making under Certainty and Uncertainty, decision-tree, group-aided decision, brain-storming. Organizing – concept, nature and process of organizing, authority and responsibility, delegation and empowerment, centralization and decentralization, concept of departmentation.	4
4	**STAFFING & MOTIVATION**	Concept, Manpower planning, Job design, recruitment & selection, training and development, performance appraisal, motivation, motivators and satisfaction, motivating towards organizing objectives, morale building.	3
5	**LEADERSHIP & COMMUNICATION**	Defining leadership and its role, should managers lead, leadership style, leadership development, Leadership behaviour. Communication- Process, Bridging gap-using tools of communication, electronic media in Communication.	3
6	**FINANCIAL MANAGEMENT**	Financial functions of management, Financial Planning, Management of Working Capital, Sources of Finance.	3

7	**MARKETING MANAGEMENT**	Functions of Marketing, Product Planning & Development, Marketing Organization, Sales Organization, Sales Promotion, Consumer Behaviour, Marketing Research and Information.	3
		TOTAL	**24**

TEXTBOOKS / REFERENCE BOOKS:

1. Robbins & Caulter, Management, Prentice Hall of India.
2. John R.Schermerhorn, Introduction to Management, Wiley-India Edition.
3. Koontz, Principles of Management, Tata-McGrew Hill.
4. Richard L. Daft, New Era of Management, Cengage Learning.
5. Stoner, Freeman and Gilbert. Jr., Management, Prentice Hall of India.
6. Koontz, Weihrich, Essentials of Management, Tata-McGrew Hill.
7. D.C. Bose, Principles of Management and Administration, Prentice Hall of India.

PRACTICALS

Course Title : MATERIAL TESTING LAB
Course Code: ME131512
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Tensile testing of metals	3
2	Hardness testing	3
3	Impact testing	3
4	Fatigue testing	3
5	Metallography	3
6	Non-destructive testing	3
	TOTAL	**18**

Course Title : INTERNAL COMBUSTION ENGINES LAB
Course Code: ME131514
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Performance evaluation two stroke petrol engine test RIG	6
2	Performance evaluation of single cylinder four stroke diesel engine test RIG	6
3	MORSE TEST: Four stroke four cylinder petrol engine test RIG	6
	TOTAL	**18**

Course Title : HEAT TRANSFER-I LAB
Course Code: ME131515
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Heat transfer through composite wall	3
2	Emissivity measurement apparatus	3
3	Forced convection apparatus	3
4	Specific heat apparatus (Heat pipe)	3
5	Heat transfer co-efficient for vertical tube (Natural Convection)	3
6	Parallel flow / counter flow heat exchanger	3
7	Radiation heat transfer apparatus	3
8	Stefan Boltzmann apparatus	3
	TOTAL	**24**

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