ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati

Course Structure and Syllabus

MECHANICAL ENGINEERING (ME)

Semester IV / ME / B.TECH

SL. NO.	SUB-CODE	SUBJECT	HOURS/WEEK			CREDIT
			L	T	P	C
	THEORY					
1	MA131401	Numerical Methods and Computation	3	2	0	4
2	ME131402	Applied Thermodynamics	3	2	0	4
3	ME131403	Mechanism and Machines II	3	0	0	3
4	ME131404	Fluid Mechanics I	3	0	0	3
5	EE131405	Electro Technology	3	0	0	3
6	HS131406	Economics & Accountancy	4	0	0	4
	PRACTICAL					
7	MA131411	Numerical Methods and Computation Lab	0	0	2	1
8	ME131413	Mechanism and Machines II Lab	0	0	2	1
9	ME131414	Fluid Mechanics I Lab	0	0	2	1
10	EE131415	Electro Technology Lab	0	0	2	1
TOTAL			19	4	8	**25**
Working Hours : 31						
Total Credits : **25**						

Course Title : NUMERICAL METHODS AND COMPUTATION
Course Code: MA131401
L-T:: C 3-2 =4

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

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Approximation in numerical computation**	Truncation and rounding errors, fixed and floating point arithmetic, Propagation of errors.	4
2	**Interpolation**	Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation.	12
3	**Numerical Integration**	Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule. Expression for corresponding error terms.	8
4	**Numerical solution of linear equations**	Gauss elimination method, matrix inversion, LU factorization method, Gauss-Seidel iterative method.	7
5	**Numerical solution of Algebraic and transcendental equation**	Bisection method, Regula-Falsi method, Newton-Raphson method.	7
6	**Numerical solution of Ordinary differential equation**	Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method.	10
		TOTAL	48

REFERENCE BOOKS:

1. Numerical Methods, SukhenduDey, Shishir Gupta, McGraw Hill Education (India) private Limited
2. Numerical Algorithms. E. V. Krishnamurthy, S. K. Sen. Affilated East-West Press
3. Computer Programming & Numerical Analysis by N Dutta, University Press.
4. Numerical Methods. E. Balagurusamy, Tata McGraw - Hill Education (1999)
5. Numerical & Statistical Methods With Programming in c by SujathaSinha
6. Numerical Methods In Eng. & Science, Dr. B. S. Grewal, Khpub publication
7. Numerical Methods for Scientific and Engineering Computation by R. K. Iyengar, New Age International
8. Numerical Mathematical Analysis by J. B. Scarborough, Oxford

Course Title : APPLIED THERMODYNAMICS
Course Code: ME131402
L-T:: C 3-2 =4

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

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**BOILERS**	CLASSIFICATION OF BOILERS, MOUNTINGS, ACCESSORIES, EVAPORATION CAPACITY, EQUIVALENT EVAPORATION, BOILER EFFICIENCY, SELECTION OF A BOILER, HEAT BALANCE SHEET.	8
2	**STEAM NOZZLES**	FLOW OF STEAM THROUGH NOZZLES, SHAPE OF NOZZLES, EFFECT OF FRICTION, CRITICAL PRESSURE RATIO, SUPERSATURATED FLOW, MASS FLOW RATE & MAXIMUM MASS FLOW RATE THROUGH NOZZLE, NOZZLE EFFICIENCY.	12
3	**AIR COMPRESSOR**	RECIPROCATING COMPRESSOR - MULTISTAGE OPERATION, EFFECT OF CLEARANCE, VOLUMETRIC EFFICIENCY, ROTARY COMPRESSORS, VANE TYPE, ROOTS BLOWER, SCREW COMPRESSORS, CENTRIFUGAL COMPRESSORS, COMPRESSION RATIO, METHODS FOR IMPROVING THERMAL EFFICIENCY, COMPRESSOR WORK AND POWER, INTERCOOLER AND AFTERCOOLER, AXIAL FLOW COMPRESSORS, CHARGING AND CHOKING OF COMPRESSORS.	12
4	**GAS POWER CYCLES**	BRAYTON CYCLE- OPEN AND CLOSED, IDEAL AND ACTUAL CYCLES, ISENTROPIC EFFICIENCY, POWER OUTPUT, METHODS TO IMPROVE THERMAL EFFICIENCY.	8
5	**VAPOUR POWER AND COMBINED CYCLES**	RANKINE CYCLE, REHEATING AND REGENERATION CYCLES, BINARY VAPOUR CYCLES.	8
		TOTAL	48

TEXTBOOKS / REFERENCE:

1. Thermal Engineering By Sarkar, B.K, Tata Mcgraw Hill.
2. Engineering Thermodynamics By Nag P.K, Tata Mcgraw Hill.
3. Applied Thermodynamics For Engineering Technologists By T. D. Eastop, Pearson.
4. Thermodynamics By Holman, J.P,, Mcgraw Hill Book Company.

Course Title : MECHANISM AND MACHINES II
Course Code: ME131403
L-T:: C 3-0 =3

ClassHours/week	3
Expected weeks	12
Total hrs. of classes	36

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**GOVERNORS**	Use and classification; Study and analysis of Watt, Porter, Proell, Hartung, Hartnell, and Wilson-Hartnell governors; Sensitiveness, stability, isochronism, hunting, effort and power of governors; Controlling force diagram and stability criteria analysis; coefficient of insensitiveness.	8
2	**BALANCING**	Static balancing; Dynamic balancing of rotating masses - graphical and analytical methods; Balancing of inline single cylinder and four cylinder engine; Balancing of symmetric two cylinder V-engine; Swaying couple; Hammer blow, Tractive force.	8
3	**GYROSCOPE**	Gyroscopic couple and precessional motion; Effect of gyroscopic couple on aeroplane and ship; Stability of two wheel and four wheel vehicles taking turn.	6
4	**VIBRATION**	Definition & types of vibration; Differential equations of vibratory motions (longitudinal & torsional); Natural frequency of free longitudinal vibration-Equilibrium method, Energy method (Rayleigh's maximum energy principle); Effect of inertia in longitudinal vibration; Natural frequency of free transverse vibration of a beam due to point loads - Rayleigh's method. Whirling of shaft, synchronous whirling; critical speed - Dunkerley's method.	6
5	**FREE DAMPED VIBRATION**	Damping factor; Logarithmic decrement. Forced vibration, concept of under damped, critically damped and over damped system; Dynamic magnifier (magnification factor); Vibration isolation and transmissibility.	8
		TOTAL	36

TEXTBOOKS / REFERENCE:

1. S.S. Rattan, Theory of Machines, Tata McGraw Hill.
2. J.S. Rao, The Theory of Machines Through Solved Problems, New Age Int. Pub.
3. W.T. Thomson, Theory of vibration with Applications, McGraw Hill.
4. Uicker, Pennock&Shigley, Theory of Machines and Mechanisms, Oxford University Press.
5. Ghosh & A.K. Mallik, Theory of Mechanisms and Machines, Affiliated East-West Publication.
6. Rao & Dukkipati, Mechanism and Machine Theory, New Age Int. Pub.
7. Theory of Machines by V.P.Singh.

Course Title : FLUID MECHANICS I
Course Code: ME131404
L-T:: C 3-0 =3

ClassHours/week	3
Expected weeks	12
Total hrs. of classes	36

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**SIGNIFICANCE OF FLOW PROPERTIES**	Classification of fluids based on variation of viscosity, continuum, no slip condition of viscous liquids. Fundamental equation in vectorial form, pressure at a point, constant density and temperature solution, unit and scales of pressure measurement, pressure measuring devices, hydrostatic force on a horizontal plane, vertical plane, inclined and rough surface, buoyancy stability of floating and submerged bodies, metacentre and metacentric height.	6
2	**KINEMATICS OF FLUID FLOW**	Fluid flow and classifications. Continuity equation in 1d & 3d. Potential flow &stream function; material derivative and acceleration , types of flow lines, streamline, path line, streak line, stream tube, steady and unsteady flow, uniform and non-uniform flow, rotational and irrotational flows, translation, vorticity, stream function, velocity potential function, flow net. Uniform flow, source and sink, vortex flow, free and forced vortex, doublet, continuity equation and its analysis based on integral form.	6
3	**DYNAMICS OF FLUID**	Equations of motion; euler's equation; bernoulli's equation; applications of bernoulli's equation, concept of static and stagnation pressures, application of pitot tube in flow measurements, pitot static tube, venturimeter, loss of head in a	4

		venturimeter, orificemeter and its classification, , hydraulic co-efficient of an orifice, factors affecting the orifice co-efficients.	
4	**MOMENTUM ANALYSIS OF FLOW SYSTEMS**	The linear momentum equation for steady flow, differential approach.	5
5	**FLOW THROUGH PIPES**	Darcy – weisbach equation of friction loss; hydraulic grade line and total energy line.	6
6	**BASIC PRINCIPLE FOR FLOW THROUGH ORIFICES**	V-notches (rectangular-v), weirs (rectangular). Flow through open channels; use of chezy's formula.	5
7	**DIMENSIONAL ANALYSIS & MODEL INVESTIGATION APPLIED TO FLOW SYSTEMS**	Buckingham pi theorem. Dimensionless numbers in fluid flow.	4
		TOTAL	36

REFERENCE BOOKS:

1. Fluid Mechanics and Machinery by Bansal, Laxmi Pub.
2. Fluid Mechanics by Som & Biswas, Tata Mcgraw Hill.
3. Fluid Mechanics by F.M. White, Tata mcgraw-Hill.
4. Fluid Mechanics by Streeter, Tata mcgraw Hill.
5. Fluid Mechanics by A.K. Mohanty. PHI.
6. Fluid Mechanics & Hydraulic Machines by Sukumar Pati.
7. Mechanics of Fluid by Massey, Taylor & Francis.
8. Fluid Mechanics by Potter &Wiggert, Cengage Learning.
9. Fluid Mechanics and Turbo machines, M.M. Das, PHI.
10. Fluid Mechanics & Hydraulics by K. Subramanya, Tata mcgraw Hill

Course Title : ELECTRO TECHNOLOGY
Course Code: EE131405
L-T:: C 3-0 =3

ClassHours/week	3
Expected weeks	12
Total hrs. of classes	36

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**DC MACHINES**	EMF generated in the armature. Methods of Excitation, Armature reaction & its effect in the performance, Methods of decreasing the effects of Armature reaction, Effect of Brush shift. Commutation process. Operating Characteristics of DC Generators: Separately Excited generators, Shunt Generators, Series Generators and Compound Generators. Torque equation of D.C motor, Operating Characteristics of Shunt, Series & Compound motors. Losses and efficiency of DC machines, Hopkinson's and Swinburne's test D.C Machine application: Generator application, Motor application.	10
2	**3-PHASE INDUCTION MACHINE**	Induction motor as a Transformer, Flux and MMF phasors in Induction motors, Equivalent circuit, Performance equations, Induction motor phasor diagram Toque-slip characteristic, Power slip characteristic. Speed control of Induction motor Polarity Test, Application of Polyphase Induction motor.	8
3	**SYNCHRONOUS MACHINES**	Construction, Types, Excitation system, Generator & motor modes Armature reaction, Theory of salient pole machine, Two reaction theory, Voltage regulation. Parallel operation of alternators, Synchronous machine connected to infinite bus, effect of change of excitation and speed of prime	10

		mover. Starting of Synchronous motor, V-Curve, Damper winding, Hunting.	
4	**FRACTIONAL KILOWATT MOTORS**	Single phase Induction motor: Construction, Double revolving field theory. Starting methods, Speed - torque characteristics, Phasor diagram, Application. Principle of operation of AC servo motors, Stepper motors, Techo generators, Brush less DC motors.	8
		TOTAL	36

REFERENCE BOOKS:

1. ELECTRICAL MACHINERY BY P.S. BHIMRA,,KHANNA PUBLISHERS.
2. ELECTRIC MACHINES BY D.P. KOTHARI & I.J NAGRATH, TATA MCGRAW-HILL.
3. ELECTRICAL MACHINES, BY P.K. MUKHERJEE & S. CHAKRABARTY, DHANPATRAI PUBLICATION.

Course Title : ECONOMICS AND ACCOUNTANCY
Course Code: HS131406
L-T ::C 4-0 = 4

ClassHours/week	4
Expected weeks	12
Total hrs. of classes	48

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**Introduction to Economics**	i) Nature and Scope of Economics ii) Concepts of micro and macro economics, economic good and free good.	4
2	**Demand and Supply Analysis**	i) Law of Demand and determinants of demand ii) Categories and Types of Elasticity of Demand- price elasticity, income elasticity, cross elasticity. iii) The determinants of elasticity, Demand elasticity and Revenue. iv) Law of Supply and Elasticity of Supply.	8
3	**The Theory of Production and Cost**	i) Iso-quant and Iso-cost line. ii) Law of Return to Scale and Law of Variable Proportion. iii) Types of Cost – total, average and marginal cost, fixed cost & variable cost, long run and short run cost, private & social cost, economist's cost & accountant's cost, opportunity cost.	8
4	**Market**	i) Features of perfect competition and monopoly. ii)Price-Output determination under--perfect competition, simple problems of perfect competition.	5

5	**Concepts of Accountancy**	Various concepts like Journal, ledger and preparation of trial balance.\	8
6	**Preparation of Final Account**	Trading Account, Profit and Loss account, Balance Sheet.	8
7	**Depreciation**	Depreciation Policy, Causes of Depreciation, straight line method.	4
8	**Cash Book**	Single, Double and Triple Column.	3
		TOTAL	48

REFERENCE BOOKS:

1. Managerial Economics by Yogesh Maheswary, PHI Learning.

2. Mankiw Gregory N.(2002), *Principles of Economics,* Thompson Asia.

3. Misra, S.K. and Puri (2009), *Indian Economy,* Himalaya.

4. Engineering Economics by Dr. Afajuddin Ahmed, G Begum, Chandra Prakash.

5. Book Keeping and Accountancy, K.R. Das, Lawyer's Books Stall.

PRACTICALS

NUMERICAL METHODS AND COMPUTATION LAB

SUBJECT	NUMERICAL METHODS AND COMPUTATION LAB
CODE	MA131411
L-T-P-C	0-0-2-1
CLASS HOUR	3hrs/week
TOTAL NO. OF CLASS	5 (APPROX)
EXPECTED NO. OF WEEKS	5 (APPROX)

EXPERIMENT NO.	TITLE OF THE EXPERIMENT	HOURS
1	Write a C program to solve algebraic equations by using Method of Bisection.	3
2	Write a C program to solve algebraic equations by using Method of False position.	3
3	Write a C program to solve algebraic equations by using Newton Raphson Method.	3
4	Write a C program to solve linear system of equations by using Gauss Jordan Method.	3
5	Write a C program to solve linear system of equations by using Gauss Seidal Method.	3
	TOTAL	15

Course Title : MECHANISM AND MACHINES II LAB
Course Code: ME131413
L-T-P ::C 0-0-2 = 1

EXPERIMENT NO.	TITLE OF THE EXPERIMENT	HOURS
1	TO DETERMINE THE SLEEVE LIFT FOR VARIOUS SPEEDS OF A HARTNELL GOVERNOR.	3
2	TO DETERMINE STATIC & DYNAMIC BALANCING OF ROTATING MASSES.	3
3	TO DETERMINE THE CORIOLLIS COMPONENT OF ACCELERATION.	3
4	TO DETERMINE THE GYROSCOPIC COUPLE.	3
MECHANISMS (DEMO)		
5	INVERSION OF FOUR BAR MECHANISM (DEMO).	1
6	GEAR DRIVE (DEMO).	1
7	BELT DRIVE (DEMO).	1
8	BRAKES & CLUTCHES (DEMO).	1
	TOTAL	16

Course Title : FLUID MECHANICS I LAB
Course Code: ME131414
L-T-P ::C 0-0-2 = 1

EXPERIMENT NO.	TITLE OF THE EXPERIMENT	HOURS
1	DETERMINATION OF METACENTRIC HEIGHT OF A SHIP MODEL APPARATUS.	3
2	VERIFICATION OF BERNOULLI'S THEOREM APPARATUS.	3
3	FREE VORTEX APPARATUS.	3
4	FORCED VORTEX APPARATUS.	3
5	MEASURING PIPE FRICTION APPARATUS.	3
6	REYNOLD'S APPARATUS.	3
7	MEASUREMENT OF FLOW OVER NOTCHES APPARATUS (TRIANGULAR & RECTANGULAR).	3
8	DETERMINATION OF $C_{C,}$ C_V & C_D APPARATUS (FOR ORIFICE, MOUTHPIECE & CONVERGENT ORIFICE).	3
	TOTAL	24

Course Title : ELECTRO TECHNOLOGY LAB
Course Code: EE131415
L-T-P ::C 0-0-2 = 1

EXPERIMENT NO.	TITLE OF THE EXPERIMENT	HOURS
1	LOAD TEST ON A DC SHUNT GENERATOR.	3
2	LOAD TEST ON A DC SERIES MOTOR.	3
3	EFFICIENCY OF A SINGLE PHASE TRANSFORMER.	3
4	V-CURVE OF A SYNCHRONOUS MOTOR.	3
5	OPEN CIRCUIT AND SHORT CIRCUIT TEST OF ALTERNATOR.	3
6	PARALLEL OPERATION OF ALTERNATOR.	3
	TOTAL	18

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