West Bengal University of Technology
B.Tech in Mechanical Engineering Syllabus
COURSE STRUCTURE IN MECHANICAL ENGINEERING

B. THIRD SEMESTER

A. THEORY:

A. THEORY							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 301	Fluid Mechanics	3	1	0	4	4
2.	ME 302	Thermodynamics	4	0	0	4	4
3.	M 303	Mathematics	3	1	0	4	4
4.	ME 304	Mechanics of Deformable Bodies	3	0	0	3	3
5.	ME 305	Computer Graphics & Solid Modelling	3	0	0	3	3
6.	EE(ME) 306	Electrical Machines	3	0	0	3	3
Total of Theory						**21**	**21**

B. PRACTICAL:

B. PRACTICAL							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 395	Graphics Laboratory - I	0	0	4	4	3
2.	ME 396	Manufacturing Process Laboratory	0	0	3	3	2
3.	EE(ME) 396	Electrical Machines Laboratory	0	0	3	3	2
Total of Practical						**10**	**7**
Total of 3rd Semester						**31**	**28**

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C. FOURTH SEMESTER

A. THEORY:

A. THEORY							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 401	Fluid Machinery	3	0	0	3	3
2.	ME 402	Engineering Thermodynamics	3	0	0	3	3
3.	ME 403	Measurements and Instrumentation	3	0	0	3	3
4.	ME 404	Analysis and Synthesis of Linkages and Machines	3	0	0	3	3
5.	ME 405	Materials Science and Technology	3	0	0	3	3
6.	ME 406	Manufacturing Technology	3	0	0	3	3
Total of Theory						**18**	**18**

B. PRACTICAL:

B. PRACTICAL							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 491	Fluid Mechanics and Fluid Machinery Laboratory	0	0	3	3	2
2.	ME 493	Measurements and Instrumentation Laboratory	0	0	3	3	2
3.	ME 496	Manufacturing Technology Laboratory	0	0	3	3	2
4.	ME 498	Graphics Laboratory - II	0	0	3	3	2
Total of Practical						**12**	**8**

C. SESSIONAL:

C. SESSIONAL							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	HU 481	Technical Report Writing & / Language Practice Laboratory	0	0	3	3	2
Total of Sessional						**3**	**2**
Total of 4th Semester						**33**	**28**

- Non-credit industrial visits to local establishments.
- 4 week practical training at an Institute approved organization during vacation, to be credited in Semester-V.

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D. FIFTH SEMESTER

A. THEORY:

A. THEORY							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 501	I.C. Engine and Steam Turbine	4	0	0	4	4
2.	ME 502	Heat Transfer	3	1	0	4	4
3.	ME 503	Design of Machine Elements	3	0	0	3	3
4.	ME 504	Technology of Machining	4	0	0	4	4
5.	ME 505	Environmental Management	3	0	0	3	3
Total of Theory						**18**	**18**

B. PRACTICAL:

B. PRACTICAL							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 592	Thermal Engineering Laboratory - I	0	0	3	3	2
2.	ME 593	Design Practice - I	0	0	3	3	2
3.	ME 594	Manufacturing Technology Laboratory	0	0	3	3	2
4.	ME 596	Strength of Materials Laboratory	0	0	3	3	2
Total of Practical						**12**	**8**

C. SESSIONAL:

C. SESSIONAL							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 599	Vocational Training					2
Total of Sessional							**2**
Total of 5th Semester						**30**	**28**

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COURSE STRUCTURE IN MECHANICAL ENGINEERING

E. SIXTH SEMESTER

A. THEORY:

A. THEORY							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 601	Automation, CNC Machines and Robotics	4	0	0	4	4
2.	ME 602	Mechatronics and Modern Control	3	0	0	3	3
3.	ME 603	Energy Conversion and Management	4	0	0	4	4
4.	ME 604	Design of Mechanical Systems	4	0	0	4	4
5.	ME 605	Dynamics of Machines	3	0	0	3	3
Total of Theory						**18**	**18**

B. PRACTICAL:

B. PRACTICAL							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 692	Mechatronics and Modern Control Laboratory	0	0	3	3	2
2.	ME 694	Design Practice – II	0	0	3	3	2
3.	ME 695	Dynamics of Machines Laboratory	0	0	3	3	2
4.	ME 696	Thermal Engineering Laboratory-II	0	0	3	3	2
Total of Practical						**12**	**8**

C. SESSIONAL:

C. SESSIONAL							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 699	Seminar	0	0	3	3	2
Total of Sessional						**3**	**2**
Total of 6th Semester						**33**	**28**

- Industrial training for 6 weeks as arranged by the Institute during vacation at the end of sixth semester, to be credited in the seventh semester.

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COURSE STRUCTURE IN MECHANICAL ENGINEERING
F. SEVENTH SEMESTER

A. THEORY:

A. THEORY							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 701	Advanced Manufacturing Technology	3	0	0	3	3
2.	ME 702	Advances in Materials Processing	3	0	0	3	3
3.	ME 703	Operations Research and Industrial Management	3	1	0	4	4
4.	HU 701	Ethics in Engineering Profession	3	0	0	3	3
5.	HU 702	Engineering Economy & Financial Management	3	0	0	3	3
Total of Theory						**16**	**16**

B. PRACTICAL:

B. PRACTICAL							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 794	CAD – CAM Laboratory	0	0	3	3	2
2.	ME 795	Project	0	0	9	9	6
Total of Practical						**12**	**8**

C. SESSIONAL:

C. SESSIONAL							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 798	Vacational Training					2
2.	G. ME 799	H. Seminar on assigned Topic	0	0	3	3	2
Total of Sessional						**3**	**4**
Total of 7th Semester						**31**	**28**

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COURSE STRUCTURE IN MECHANICAL ENGINEERING

I. EIGHTH SEMESTER

A. THEORY:

A. THEORY							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 801	Industrial Engineering	3	0	0	3	3
2.		Elective – I	3	0	0	3	3
3.		Elective – II	3	0	0	3	3
4.		Elective - III	3	0	0	3	3
Total of Theory						**12**	**12**

B. PRACTICAL:

B. PRACTICAL							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 891	Industrial Engineering Laboratory	0	0	3	3	2
Total of Practical						**3**	**2**

C. SESSIONAL:

C. SESSIONAL							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	ME 898	Project / Thesis with defence of project	0	0	12	12	8
2.	ME 881	Participation in Institutional Activities					2
3.	ME 899	Comprehensive Viva-Voce					4
Total of Sessional						**12**	**14**
Total of 8th Semester						**27**	**28**

List of Elective Papers

Elective – I *(Any one subject out the following) :*

ME 802 Computational Heat Transfer
ME 803 Combustion Engineering
ME 804 Reliability Engineering & Plant Maintenance
ME 805 Tribology and Terotechnology
ME 806 Non-conventional Energy Sources
ME 807 Finite Element Method and its Application
ME 808 Experimental Stress Analysis

Elective – II *(Any one subject out of the following) :*

ME 811 Automotive Engineering
ME 812 Robotics and Robot Applications
ME 813 Management Information Systems
ME 814 Energy Management & Auditing
ME 815 Refrigeration and Airconditioning
ME 816 Optoelectronics and Laser Material Processing
ME 817 Gas Turbine Theory
PE 807 Computer Integrated Manufacturing
IT 806 Information Technology

Elective –III *(Any one subject out of the following) :*

ME 821 Total Quality Management
ME 822 Mechanics of Composite Materials
ME 823 Fracture Mechanics
ME 824 Advanced Sensors for Engineering Applications & NDT
IT 816 Entrepreneurship and E-business
CS 815 Computer Networking and Web Based Technology

Semester-wise Credits

Semester	Number of Theory Papers	No. of Practical Papers	No. of Sessional Papers	Credits
Semester III	**6**	**3**	**-**	**28**
Semester IV	**6**	**4**	**1**	**28**
Semester V	**5**	**4**	**1**	**28**
Semester VI	**5**	**4**	**1**	**28**
Semester VII	**5**	**2**	**2**	**28**
Semester VIII	**4**	**1**	**3**	**28**

SEMESTER - III

ME 301 : Fluid Mechanics
Contacts : 3L + 1T
Credits : 4

Introduction : Definition of fluid, concept of continuum;
Fluid Properties : Density, Viscosity, Surface tension, Vapour pressure
Fluid statics : Body and surface forces, Stress at a point, State of stress in fluid at rest and in motion, Pressure distribution in hydrostatics, manometers, forces on plane and curved surfaces, Buoyancy and the concept of stability of floating and submerged bodies.
Fluid kinematics : Scalar and vector fields, Eulerian and Lagrangian approaches, Material derivative, Velocity and acceleration, Streamline, Streak line and path line, Deformation, rotation and vorticity, Deformation rate and strain rate tensor, Circulation.
Fluid flow : System and control volume approaches, Transport theorems, Continuity equation, Euler's equation, Bernoulli's equation, Momentum equations for stationary, moving and rotating control volumes, Application of Bernoulli's equation, static and dynamic pressure.
Fluid measurements : Pitot tube, Siphon, Venturimeter, Orificemeter, Mouthpiece, Sudden expansion in a pipe, Weirs and notches.
Viscous incompressible flow : Introduction to Navier Stokes equation, Boundary layer flow, Drag and lift, Laminar and turbulent flow, Couette flow, Plane Poisuille and Hagen Poisuille flow.
Internal viscous flow : Reynolds experiment, Critical Reynolds number, Darcy - Weisbach and Fanning friction factor, Moody's diagram, Minor losses and flow through simple network of pipes.
Principal of similarity : physical similarity, Dimensional Analysis, Buckingham pi theorem, Model studies and dimensionless parameters, Froude number, Euler number, Mach number, Weber number.

References :

1. Introduction to Fluid Mechanics and Fluid Machines by S.K.Som and G.Biswas.
2. Mechanics of Fluids by Irving H.Shames.
3. Fluid Mechanics, Douglas, Pearson Education
4. Fluid Mechanics by Victor L.Streeter.
5. Fluid Mechanics by Frank M. White.
6. Introduction to Fluid Mechanics by James A.Fay.
7. Fluid Mechanics and Hydraulics by J. Lal.
8. Fluid Mechanics by A.K.Jain
9. Engineering fluid mechanics,Garde,SCITECH

ME 302 : Thermodynamics
Contacts : 4L
Credits : 4

Introduction; Microscopic and macroscopic viewpoints in thermodynamics; Fundamental concepts of system, control volume, state properties, equilibrium, processes etc,Zeroth law;
Survey of units and dimensions; forms of energy and energy interaction; heat and work; State postulate; thermodynamic properties of pure substance in solid, liquid and vapour phases; P-V-T behaviour of simple compressible substances; phase rule; thermodynamic property tables and charts; ideal and real gases; equations of state; compressibility factor; generalised compressibility chart; First law of thermodynamics for closed loop system, internal energy and enthalpy; First law for control volumes, Steady flow and unsteady flow applications. Process calculations for ideal and real gases using equations, tables and charts.
Definitions of Heat Engine, Heat Pump, Thermal efficiency, COP; Carnot cycle.
Second Law of thermodynamics; Statements and corollaries; entropy; concept of reversibility and irreversibility.

Second law analysis of Control volumes; concept of entropy generation, reversible work, Availability and Irreversibility.
Tds relations; Maxwell equations; Clapeyron equation; Clausius Clapeyron equation, Joule Thompson coefficient; compressibility and expansion coefficient, development of property data in graphical and tabular form.

References :

1. Engineering Thermodynamics by P.K.Nag.
2. Engineering Thermodynamics, Rogers, Pearson Education
3. Engineering Thermodynamics, Rahul Gupta, Asian Books
4. Thermodynamics by Kenneth Wark.
5. Engineering Thermodynamics by Gordon Rogers and Yon Mayhew.
6. Fundamentals of Classical Thermodynamics by Van Wylen and Sonntag.

Mathematics
Code: M 303
Contact: 3L + IT
Credit: 4
Allotted Hrs.:48L

Series Solution of Ordinary Differential Equation (ODE); Special Functions:

Introduction, validity of series solution of an ordinary differential equation, general method to solve equation of the type: $P_0y''+P_1y'+P_2y=0$; problems; Bessel's equation; properties of Bessel's function; Recurrence formula for Bessel's function of first kind ($J_n(x)$); Equation reducible to Bessel's equation; Legendre's equation, Legendre function; Recurrence formula for Legendre function ($P_n(x)$); Orthogonality relation. *12L*

Calculus of Complex Variable:
Functions, Limits and Continuity, Analytic Functions, Cauchy Riemann Conditions, Analytic Continuation, Complex Integration and Cauchy's Theorem, Cauchy's Integral Formula, Taylor's and Laurent Series, Zeros of an Analytic Function; Poles, Essential Singularities, Residue Theorem and its application to evaluation of integral, Introduction to Conformal Mapping, Simple problems. *10L*

Partial Differential Equations (PDE) and its Applications:

Introduction, linear and nonlinear equation of first order; examples; homogeneous linear equations with constant coefficients and variable coefficient of second order, Separation of variables, Formulation and solution of wave equation; one dimensional heat flow equation and solution; two dimensional heat flow equation and solution. *14L*

Linear Programming Problem (L.P.P):

Mathematical Formulation, Graphical Solution and Simplex Method, Charnes Big-M Method, Transportation Problems, Assignment Problems (Hungarian Method). *12L*

Total *48L*

Reference:

1. Higher Engineering Mathematics by Dr. B. S. Grewal
2. Linear Programming & Game Theory by Chakraborty & Ghosh
3. Complex Variables by M. R. Spiegel
4. Partial Differential Equation by K. S. Rao
5. Engineering Mathematics, Arumugam, Scitech.

ME 304 : Mechanics of Deformable Bodies
Contacts : 3L
Credits : 3

Concept of stress, normal and shearing stresses in axially loaded memebers, factor of sfety and introduction to design for strength - concept of strain, normal and shearing strains - stress-strain relationship - generalised Hook's Law - strain compatibility in two dimensions and application to isotropic materials - plane stress and plane strain - Poisson's ratio - stress strain diagrams for uniaxial loading - strain measurements - strain energy - relationship between elastic constants - deformation of axially loaded members and statically indeterminate problems - thermal stresses; Torsion of circular shafts - stress and deflections in close coiloed helical springs subjected to axial forces; Memebers subjected to flexural loads - reactions for statically determinate beams - relationships between load, shear force and bending moment - shear force and bending moment diagrams - singularity functions - application of Dirac Delta functions in beam bending problems; Elastic curve - theory of simple bending - bending stresses in beams - members subjected to combined loads - stresses in short struts with eccentric loading - kern of rectangular and circular sections - composite beams - built up beams, shear flow and shear centre; Transformation of plane stresses and strains - principal stresses and principal planes - principal strains - Mohr's Circle of stresses and strains - principal stresses in 3 D - strain rosettes, principal stresses for strain measurements; compounding of stresses - combined bending and torsion - investigation of stress at a point - thin walled pressure vessels - Hoop's stress - biaxial stresses - yield theories - principles of design for strength; deflection of beams - direct integration method, moment area method - buckling of columns - Euler's theory - critical loads and critical stresses for different types of constants - statically indeterminate structures - theorem of three moments - strain energy due to pure bending and shearing stresses - deflection by energy method.

References :

1. Engineering Mechanics of Solids by E.P.Popov, Prentice Hall/ Pearson Education
2. Introduction to Solid Mechanics by I.H.Shames, 2nd ed., Prentice Hall/ Pearson Education
3. Mechanics of Solids,Singh, Pearson Education
4. Strength of Materials Vols - I & II by S.P.Timoshenko, CBS Publishers
5. Introduction to the Mechanics of Solids by S.H.Crandall, N.C.Dahl and T.J.Lardner, 2nd ed., McGraw Hill International.

ME 305 : Computer Graphics and Solid Modelling
Contacts : 3L
Credits : 3

Introduction : Definition of computer graphics, Graphics hardware, Types of systems, Input/Output devices, graphics standards, Data structure and data base, modes of graphics operation, Modelling and viewing.
Geometric modelling : Types and mathematical representation of curves, Parametric representation of analytic and synthetic curves, Types and mathematical representation of surfaces, Parametric representation of analytic and synthetic surfaces, Plane surface, Ruled surface, Surface of revolution, Hermite bi-cubic surface, Beizer surface, B-spline surface, Sculptured surface, Surface manipulation, Displaying evaluating points and curves, Segmentation, Trimming, Integration, Projection and Transformations engineering applications.
Types and mathematical representation of solids : Half spaces, Boundary representation (B-Rep), Constructive Solid Modelling (CSG), sweep representation, Solid modelling based application.
Two and three dimensional graphics : Transformations of geometric models - translation, Scaling, Reflection, Rotation, Homogeneous Representation and Mappings; Projection of geometric models - Orthographic and perspective projection, Engineering applications.
Visualization, Hidden line and Hidden Surface and Solid removal, Visibility of objects, Shading and color models, Editing.

References :

1. Schaum's Outline of Theory and Problems of Computer Graphics by Roy A.Plastock & Gordon Kalley, McGrawhill.
2. Hill, Computer Graphics using open GL, Pearson Education
3. Foley , Computer Graphics, Pearson Education

4. Principles of Interactive Computer Graphics by William M.Newman and Robert F.Sproull, 2nd ed., McGrawhill.

EE(ME) 306 : Electrical Machines
Contacts : 3L
Credits : 3

D. C. Generators and Motors : Principle, construction and function of various parts, methods of excitation, armature reaction, characteristics of compound machines, motor torque equation, characteristics, starting and speed control applications
Transformers : Principle, construction, emf equation, regulation and efficiency.
Induction motor : Single phase I.M construction, principles of operation of different kinds of single phase I.M., construction, principle and speed control of 3-phase I.M.
Alternator : Principle and construction, excitation and voltage regulation.
Synchronous motor : Principle, starting and speed control.
Miscellaneous : Stepper Motor, Servo motor.

References :
1. Electrical Machines by Nagrath I.J. and Kothari D.P., TMH.
2. Electrical Machines by Fitzgerald, Kingsley, Kusko, Dumas, MGH, 4th Edition.
3. Electrical Machinery and Transformers by I.L.Kosow, PHI, 4th Edition.
4. Electrical Machines, Wildi, Pearson Education
5. Advanced Electrical by Cotton H., Wheeler & Co., 1995.

ME 395 : Graphics Laboratory - I
Contacts : 4P
Credits : 3

Computer Aided drafting problems, dimension and geometrical tolerancing, Surface modules and representation, examples.
Problems of two and three dimensional geometric models, Solid modelling based applications, Partial views and scientific problems, Auxiliary sections, Simple mechanical assembly drawings, Schematic product symbols for standard components in mechanical, electrical and electronic systems, welding symbols and pipe joints.
Books:
Text Book on Engineering Drawing,Narayana/KannaiaH,Scitech

ME 396 : Manufacturing Process Laboratory
Contacts : 3P
Credits : 2

Pattern Making; pattern material, pattern allowances and types of patterns.
Mould making Practice: Uses of moulding tools: green sand moulding, gating system, risering system, core making.
Study of cupola.
Basic Forging processes like upsetting, drawing down and forge welding.
Books:
Manufacturing Technology,Radhakrishnan,Scitech

EE(ME) 396 : Electrical Machines Laboratory.
Contacts : 3P
Credits : 2

Constructional features of dc machines, open circuit and load test of dc shunt generators, speed control and characteristics of dc shunt motor, OC and SC test, Load test, regulation and efficiency of transformers, Study of different parts of a 3-phase induction motor, speed control and load test on 3-phase I.M. alternator performance determination, single phase induction motor starting and speed control.

SEMESTER - IV

ME 401 : Fluid Machinery
Contacts : 3L
Credits : 3

Introduction : Classification of fluid machines.
Rotodynamic machines: Basic equation of energy transfer, definition of impulse and reaction machines, principle of similarity and dimensional analysis in rotodynamic machines, concept of specific speed.
Pelton wheel, analysis of force and power generation in a Pelton wheel, governing of Pelton wheel. Francis turbine, velocity triangles and analysis of force, power and efficiency, net head across Francis turbine, draft tubes. Kaplan turbines. Characteristics of reaction turbines. Comparison of specific speeds of hydraulic turbines.
Pumps : Classification of pumps. Centrifugal pump, pumping system and net head developed by a pump, manometric efficiency, losses in centrifugal pumps, head-discharge and power-discharge characteristics of a centrifugal pump. Axial flow pump. Matching of pump and system characteristics, pumps in series and parallel.
Reciprocating Machines : Reciprocating pump, head-discharge characteristics, rate of delivery. Multi-cylinder pumps. Air vessels. Gear pump.
Air compressors : Centrifugal compressor, principle of operation, velocity triangles, stagnation pressure and temperature rise. Axial flow compressor, cascade flow and nomenclature, velocity triangles, degree of reaction, stalling and surging of compressor. Fans and Blowers. Testing and characteristics of Fluid Machinery.

References :

1. Hydraulic Machines by J. Lal.
2. Hydraulic and Compressible Flow Turbomachines by A.T.Sayers.
3. Turbine, Compressors and Fans by S.M.Yahya.
4. Turbomachines,Radhakrishnan,Scitech

ME 402 : Engineering Thermodynamics
Contacts : 3L
Credits : 3

Compression of air and gases : Reciprocating compressors and their cycles, work required, volumetric efficiency, FAD, compression efficiency and compressor efficiency; multistage compression.
Air standard engine cycles : Otto, Diesel, Dual combustion, Brayton and Stirling cycles; Gas turbine cycles with intercooling, reheating and regeneration; use of air tables.
Vapour cycles : Carnot cycle, Rankine cycle, work ratio, reheat and regenerative cycles used in steam power plants.
Reversed Carnot cycle: Vapour and air refrigeration cycles, absorption refrigeration cycles.
Binary vapour cycles. Cogeneration cycles.
Psychrometrics, calculation of properties of air-water vapour mixtures. Processes in pyshcrometric chart.
Combustion Analysis : Fuels, HIV and LTV, Air requirements, excess air, analysis of products of combustion. Enthalpy of formation, adiabatic flame temperature, enthalpy of combustion, heat of reaction.
Second Law analysis of reacting systems.
Third law of thermodynamics.

References :

1. Engineering Thermodynamics by P.K.Nag.
2. Engineering Thermodynamics, Rogers, Pearson Education
3. Engineering Thermodynamics, Rahul Gupta, Asian Books
4. Thermodynamics by Kenneth Wark.
5. Engineering Thermodynamics by Gordon Rogers and Yon Mayhew.
6. Fundamentals of Classical Thermodynamics by Van Wylee and Sonntag.

ME 403 : Measurements and Instrumentation
Contacts : 3L
Credits : 3

Basic concepts : Definition of terms, calibration, standards, generalised measurement systems, static and dynamic performance characteristics; Analysis of experimental data; Instrumentation for measurement of position and displacement, force, pressure, velocity, temperature, proximity and range. Concept of feedback; Open and closed loop control systems, Transducers and devices for engineering applications, digital readouts, data acquisition and processing.
Metrology : Standards, Slip gauges, Measurement of angles, tapers, threads, coordinates, inspection of straightness, flatness, alignment and surface finish, Gear Measurements, Measurements of various product features using Mechanical, Pneumatic, Optical and Electronic Instruments, Interferometry and use of optical flats.

References :
1. Experimental Methods for Engineers by J.Holman, 6th ed. McGrawhill.
2. Mechanical Measurements by T.G.Beckwith, N.L.Buck and R.D.Marangoni, 3rd ed., Narosa Publishing House.
3. Measurment Systems - Application and Design by E.O.Doeblin, 4th ed., McGrawhill.
4. Instrumentation, Measurment and Analysis by B.C.Nakra and K.K.Chaudhary, TMH.
5. Metrology for Engineers by J.W.F. Gallies and C.R.Shotbolt, Cassel.
6. Metrology by R.K.Jain.
7. Mechanical measurements, Beckwith, Pearson Education

ME 404 : Analysis and Synthesis of Linkages and Machines
Contacts : 3L
Credits : 3

Mechanisms and machines; Elements of kinematic chain, mobility and range of movements, miscellaneous mechanisms, Straight line generating mechanisms, Intermittent motion mechanism, Velocity and acceleration - analysis of displacement, planar mechanisms by graphical, analytical and computer aided methods, Synthesis of linkages, Kinematic analysis of machine elements, Freudeustein's equation, Dimensional analysis for motion, Functioning and path generation, Dynamics of rotary and reciprocating machines, Critical speeds, Turning moment diagrams and flywheels, Cam profile analysis, gear tooth profiles, static and dynamic force analysis of constrained kinematic systems, Precisional motions and gyroscopic stability.

References :
1. Mechanism and Machine Theory by J.S.Rao and R.V.Dukkipati, New Age International.
2. Theory of Machines and Mechanisms by J.J.Shigley and J.J.Uicker, McGrawhill.
3. Theory of Machines by S.S.Rattan, TMH.

ME 405 : Materials Science and Technology
Contacts : 3L
Credits : 3

Nature and properties of materials : Crystal structures and lattices, crystal imperfections, slip and dislocations, plastic deformation, phase diagrams, solidification and structure of metals and alloys, Iron-carbon diagram, various types of bonds, mechanical, magnetic and electronic properties, binary phase equilibrium characteristics of alloy, ternary phase diagram.
Metallography : Study of microstructure
Powder Metallurgy.
Heat treatment processes - general classifications, various heat treatment of steels, properties and applications of alloy steels, tool steels, stainless steels and cast iron, different heat treatment furnaces.
Hot and cold working of metals, recovery, recrystallisation and grain growth.
Fracture, fatigue and creep phenomenon in metallic materials.
Non-ferrous materials - Copper and Aluminium based alloys.
Mechanical, Magnetic, Electrical and Electronic properties of metals, alloys, ceramics, semiconductors and composites.

References :
1. Material Science and Engineering by V.Raghavan, Prentice Hall.
2. Introduction to Engineering Materials by B.K.Agarwal, TMH.
3. Elements of Material Science & Engineering, Van Black, Pearson Education
4. Mechanical Metallurgy by G.E.Dieter, McGrawhill.
5. Physical Metallurgy Principles by R.E.Reedhill, East-West Publishers.
6. Principles of Materials Science by W.F.Smith, 3rd ed., McGrawhill.
7. Steel and its Heat Treatment by K.E.Theling, Butterworth.
8. Material Science by J. C. Anderson, K. D. Leaver, R. D. Rawlings and J. M. Alexander, Chapman Hall, 4th Ed., 1992.
9 .Material Science,Palanisamy,Scitech

ME 406 : Manufacturing Technology
Contacts : 3L
Credits : 3

Types of production and production processes, product configuration and manufacturing requirements.
Pattern making, allowances and core making.
Casting processes of ferrous and non-ferrous metals including die casting, investment casting, centrifugal casting, loam molding, transfer molding. Solidification principles, design of molds, risering, sprues and gating system, casting defects.
Metal joining processes : soldering, brazing, fusion and non-fusion welding processes, various modern welding processes like TIG, MIG, Submerged Arc Welding, Friction Welding. Welding defects.
Fundamentals of hot and cold working processes – forging, extrusion and rolling.

References :
1. Manufacturing Engineering Technology, K. Jain, Pearson Education
2. Manufacturing Technology: Foundry, Forming and Welding by P.N.Rao, TMH.
3. Principles of Manufacturing Materials and Processes, James S.Campbell, TMH.
4. Welding Metallurgy by G.E.Linnert, AWS.
5. Production Engineering Sciences by P.C.Pandey and C.K.Singh, Standard Publishers Ltd.
6. Manufacturing Science by A.Ghosh and A.K.Mallick, Wiley Eastern.
7.Manufacturing Technology,Radhakrishnan,Scitech

ME 491 : Fluid Mechanics and Fluid Machinery Laboratory
Contacts : 3P
Credits : 2

Fluid flow measurements: Coefficient of discharge for venturimeter, orificemeter, nozzlemeter, weirs.
Flow through pipes : Pipe friction in laminar and turbulent flow regimes. Pitot tube experiments on viscous flow and boundary layer theory.
Experiments on Fluid Machinery : Pumps, jet pumps, Blowers, Compressors.
Experiments on Turbines : Francis and Pelton turbines, governing of turbines.

ME 493 : Measurements and Instrumentation Laboratory
Contacts : 3P
Credits : 2

Lab experiments involving :
Measurements of position, displacement, velocity, force, temperature, proximity/range.
Measurements of various product features using mechanical, pneumatic, optical and electronic instruments, interferometer, surface roughness measurements, measurements of threads and gears.
Laboratory experiments and exercises involving hardware and software modular based off-line and on-line product gauging and inspection, information recording and processing etc.

ME 496 : Manufacturing Technology Laboratory
Contacts : 3P
Credits : 2

Casting: sand preparation, sand testing: specimen preparation, permeability, clay content, grain fineness number, green compression strength, green shear strength, dry strength, hardness. Characterisation of materials - solids and fluids.
Introduction to primary technology processes involving forging and casting, preparation of foundry sand and molds, Experiments on properties of post casting, fettling, cleaning, deburring, polishing and painting operations.
Surface preparation and etching techniques, heat treatment and metallographic studies.
Laboratory experiments in Fabrication processes : Spot, MIG, ARC and Gas Welding, Testing of Joints.

ME 498 : Graphics Laboratory - II
Contacts : 3P
Credits : 2

Drafting exercises involving preparation of detailed drawings of product assembly, aggregation of assembly, exploded machine kinematics, foundation of structure drawings and multilayered system drawing, computer aided drafting using CATIA, AUTOCAD and ProEngineer like softwares.

HU 481 : Technical Report writing & / Language Practice Laboratory
Contacts : 3S
Credits : 2

Topics to be covered and number of hours required for it:

1. Introductory lecture is to be given to the students so that they get a clear idea of the syllabus and understand the need for having such a practice lab in the first place(3 hours).
2. Conversation practice is done on given situation topics. The students are also made to listen to pre-recorded cassettes produced by British Council and also by the Universities of Oxford and Cambridge (6 hours)
3. Group Discussions:- The students are made to understand the difference between the language of conversation and group discussion. Strategies of such discussions are to be taught to them. It is also helpful to use videocassettes produced by the U.G.C. on topics like group-discussion. Afterwards the class is divided into groups and the students have to discuss on given topics on current socio-economic-political-educational importance(12 hours)
4. Interview sessions : students are taught the do's and don'ts of facing a successful interview. They then have to face rigorous practices of mock-interviews. There would be simulations of real life interview sessions where students have to face an interview panel(12 hours)
5. Presentations: The secrets of an effective presentation are taught to the students. Then each and every student has to make lab presentations with the help of the overhead projector/ using power point presentation and other audio-visual aids in the laboratory. They also have to face the question answer sessions at the end of their presentation (12 hours)
6. Classes are also allotted to prepare the students for competitive examinations like the TOEFL by making the students listen to specially produced CD/ cassettes of such examinations (3 hours)

The overall aim of this course is to inculcate a sense of confidence in the students and help them to become good communicators in their social as well as professional lives.

References :

1. Business Correspondence & Report Writing by R.C. Sharma and K.Mohan, TMH
2. How to prepare for Group Discussion & Interview (With Audio Cassette) by Prasad, TMH
3. Spoken English – A self-learning guide to conversation practice (with Cassette) by Sasikumar, TMH

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SEMESTER - V

ME 501 : IC Engine and Steam Turbine
Contacts : 4L
Credits : 4

I.C. Engine: Principle of working; basic engine types; comparison of air standard cycles; air cycle analysis with variable specific heats; introduction to fuel air cycle analysis; actual cycles; mep; thermal efficiency.
Availability analysis for engine processes.
Combustion calculations related to I.C. Engine fuels. Desirable characteristics of fuels for I.C. Engine.
Mixture requirements for S.I Engine; carburation pressure drop - flow relation; fuel air ratio; complete carburetor. Petrol injection. Ignition system in S.I. Engine : Battery, Magneto, and electronic ignition systems; ignition timing and spark advance.
Fuel oil injection in C.I. Engine ; fuel injection systems; injection pumps and nozzles.
Theories of combustion in S.I and C. I. Engines - methods for reduction of detonation and knock; Octane number and Cetane number.
Supercharging in I.C. Engine; supercharging limits;
Scavenging of I.C. engines, two stroke S.I. and C.I. engines; scavenging parameters; ideal scavenging processes; actual scavenging; scavenging pumps.

Steam Turbine: Steam Generation - introduction to Boilers; Principles of action of turbines, classification, relative advantages of turbines as prime movers, isentropic flow through nozzle, nozzle shape, critical pressure ratio and maximum flow, effect of friction in nozzle flow, under-expansion and over-expansion in nozzles, supersaturated flow through nozzles.
Flow through impulse turbine blading, velocity diagram, blade work, blade efficiency, optimum velocity ratio, multistaging and its advantage, velocity compounded impulse turbine, pressure compounded impulse turbine, reheat factor, internal efficiency, state point locus.
Flow through reaction turbine blading, velocity diagram, degree of reaction, blade work, blade height, stage efficiency, optimum velocity ratio, axial thrust in reaction turbine, erosion of turbine blades.

References :

1. Internal Combustion Engines by V.Ganesan, TMH.
2. Gas Turbine Theory, Cohen, Pearson Education
3. The Internal Combustion Engine - Theory and Practice Vols. I & II by C.F.Taylor, MIT Press.
4. Steam and Gas Turbines by R.Yadav, Central Book Depot.
5. Theory and Design of Steam and Gas Turbines by Lee, McGrawhill.

6.Internal combustion Engines, Ramalingam, Scitech

ME 502 : Heat Transfer
Contacts : 3L + 1T
Credits : 4

Introduction: modes of heat transfer.
Conduction: Fourier law of heat conduction for isotropic material.Thermal conductivity. Derivation of the energy equation in three dimensions including transient effect. Nondimensional - thermal diffusivity and Fourier number. Types of boundary conditions (Dirchlet, Neumann, mixed type). One dimensional solution with and without heat generation. Analogy with electrical circuits.
Fins, rectangular and pin fins. Fin effectiveness and efficiency.
Critical thickness of insulation.
Lumped parameter approach and physical significance of time constant, Biot number, Validity of lumped parameter approach. Introduction to Heissler Chart.
Numerical methods for heat conduction.
Radiation : Physical mechanism of thermal radiation, laws of radiation, definition of black body, emissive power, intensity of radiation, emissivity, reflectivity, transmittivity, irradiation, radiosity.
Radiation exchange between black bodies, concept of Gray-Diffuse Isotropic (GDI) surface. Radiation exchange between GDI surfaces by radiation network and radiosity matrix method. Radiation shielding.
Convection: Introduction, Newton's law of cooling and significance of the heat transfer coefficient.

Momentum and energy equations in two dimensions, nondimensionalisation, importance of nondimensional quantities and their physical significance. Order of magnitude analysis for flow over a flat plate. Velocity and thermal boundary layer thickness by integral method. Analogies between momentum, heat and mass transfer. Natural convection, effect of coupling on the conservation equations, vertical flat plate (concept and correlations)
One dimensional solution for Couette flow and Poisullie flow.
Concept of developing and developed flow.
Introduction to the concept of similarity.
Heat exchangers: Types of heat exchangers, parallel and counterflow types, Introduction to LMTD. Correction factors, fouling factor. E-NTU method for heat exchangers.

References :

1. Fundamentals of Heat and Mass Transfer by F.P.Incropera and D.P.Dewitt, 4th ed., John Wiley & Sons
2. Principles of Heat Transfer,Kreith,ASIAN BOOKS/THOMPSON
3. Heat Transfer, Long, Pearson Education
4. Heat Transfer by J.P.Holman, 8th ed., McGrawhill.
5. Elements of Heat & Mass Transfer by Vijay Gupta, 2nd ed., New Age International Publishers.
6. Heat Transfer - A Basic Approach by M.N.Ozisik, McGrawhill.

ME 503 : Design of Machine Elements
Contacts : 3L
Credits : 3

General considerations and procedure of Machine Design, Design stress, factor of safety, stress and deflection analysis, engineering materials and applications, fits and tolerances, design of fasteners and fastenings - pin, cotter,knuckle, screw, rivets and welded joints, design of shafts and couplings, common power and force transmitting power screws, belt drives and springs, pressure vessels and pipes.

References :

1. Mechanical Engineering Design by J.F.Shigley, McGrawhill.
2. Machine Design, Norton, Pearson Education
3. Design of Machine Elements by M.F.Spotts, Prentice Hall.
4. Mechanical Analysis and Design by A.H.Burr and J.B.Cheathak, 2nd ed., Prentice Hall.

ME 504 : Technology of Machining
Contacts : 4L
Credits : 4

Metal Cutting; mechanics, Tool materials, Temperature, Cutting Forces, Wear and Tool Life considerations, tool geometry and chip formation, surface finish and machinability, optimization of cutting parameters; Machine Tools: generation and machining principles, Setting and operations on machines viz. lathe, milling, shaping, slotting, planing, drilling, boring, broaching, grinding (cylindrical, surface, centreless), thread rolling and gear cutting machines; Tooling: jigs and fixtures, principles of location and clamping; Batch Production and Mass Production, Operations on Capstan and Turret Lathes, Single Spindle Automats.
Finishing: microfinishing operations like honing, lapping and superfinishing.

References :

1. Principles of Metal Cutting/Principles of Machine Tools by G.C.Sen and A.Bhattacharya, New Central Book Agency, Kolkata.
2. Fundamentals of Metal Cutting Machine Tools by G.Boothroyd, TMH.
3. Production Technology, HMT Publication, TMH.
4. Production Engineering Sciences by P.C.Pandey and C.K.Singh, Standard Publishers Ltd.
5. Manufacturing Science by A.Ghosh and A.K.Mallik, Wiley Eastern.
6. Manufacturing Process by Danilovsky and Maslov et. Al, Mir Publication.
7 Metal working and Metrology,Narayana,Scitech

ME 505 : Environmental Management
Contacts : 3L
Credits : 3

Development dynamics in environmental perspective; Macro-principles of eco-development; continuing, renewable, non-renewable and extrinsic sources in eco-systems; Bio-sphere cycle, Oxygen-Carbon cycle and other natural eco-systems.
Demographic structure: Population growth and other human factors in development processes; The economics of eco-development; Cost benefit analysis of pollution abatement.
Problems of technological choice and technological transfer; Extent, ideals, exogenous and policies of alternative development systems; eco-development consideration; devising strategies and operational tactics for planning of projects compatible to eco-systems.
Environment pollution and its control strategies, Sustainable Development, ISO standards for Environmental Management.

References :
1. Introduction to Environmental Engineering by Mackenzie, L. Davis and A. David, Cornwell, McgrawHill, 3rd Ed.
2. Environmental Engineering by Peary, Rowe and Tchobanoglous, McgrawHill.
3. Integrated Solid Waste Management : Engineering Principles and Management Issues by Tchobanoglous, Theisen and Vigil.
4. Environment Impact assessment by Canter.
5. ISO 14000.

ME 592 : Thermal Engineering Laboratory - I
Contacts : 3P
Credits : 2

Experiments on heat transfer : thermal conductivity of solids, liquids and gases, nautral and forced convection, boiling heat transfer, cooling tower;
Experiments on emissivity and absorvity; Heat exchangers: LMTD methods, mass transfer.

ME 593 : Design Practice- I
Contacts : 3P
Credits : 2

Drawing board exercises compatible to the course ME 503 : Design of Machine Elements.

ME 594 : Machining Technology Laboratory
Contacts : 3P
Credits : 2

Laboratory exercises involving machining of complex product configurations,machining of spur and helical gears, relieving and profiling, contouring, finishing processes and grinding of tools and cutters are to be done.

ME 596 : Strength of Materials Laboratory
Contacts : 3P
Credits : 2

Tension Test: stress-strain diagram, determination of yield strength, ultimate strength, modulus of elasticity, percentage elongation and percentage reduction in areas; Compression Test; Torsion Test; Hardness Tests: Brinnel and Rockwell tests; Impact tests: Charpy and Izod tests; Bending test: determination of bending stresses; Fatigue Test.

ME 599 : Vacational Training
Credits : 2

Vacational Training (of four weeks) in Semester IV, credit to be given in Semester V.

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SEMESTER VI

ME 601 : Automation , CNC Machines and Robotics
Contacts : 4L
Credits : 4

Basic principles of automation; Hard Automation, Flexible Automation Extending the capabilities of conventional machines through improved devices and manipulators; Transfer Machines for Assembly, Multispindle Automatics, Basic principles of numerical control; Methods of coding and programming; CNC, DNC and Machining Centres; Manual Programming, Computer Aided (APT) programming; Adaptive control; Economics of numerical control.
Introduction to Robotics: Synthesis of elements with movability constraints; classification and specification of robots, Laws of Robotics, Elements of robot anatomy; Hydraulic, pneumatic and electrical manipulators; End-effectors and their design; Robot Controllers with microprocessors or fluidics; Sensors – Tactile and non tactile type; Performance analysis of industrial robots and their manufacturing applications; Economics of robotics.

References :

1. Introduction to Robotics by J.J.Craig, Pearson Education
2. Robotics & Control, Nagrath, TMH
3. Robotics Technology and Flexible Automation by S.R.Deb, TMH.
4. Industrial Robotics, Hodges, Jaico
5. Principles of Machine Tools by A.Bhattachary and G.Sen, New Central Book Agency, Kolkata.

ME 602 : Mechatronics and Modern Control
Contacts : 3L
Credits : 3

Introduction to Mechatronics: Definition, Mechatronics in manufacturing, products and design. Comparison between Traditional and Mechatronics approach.
Electronics: Review of fundamentals of electronics, logic gates and their operations, Data conversion devices, sensors, microsensors, transducers, electrical contacts, actuators, and switches, contactless input devices, signal processing devices; relays, output devices. Drives: Stepper motors, servo drives.
Mechanical: Ball screws, linear motion bearings, transfer systems.
Hydraulics: Hydraulic elements, actuators and various other elements. Design of hydraulic circuits.
Control Systems: Open loop and closed loop control, block diagrams, transfer functions, Laplace transforms; Mathematical model of physical system; PI and PID controllers, 8085 microprocessor, PLC controller and Ladder diagrams, hydrualic and pneumatic controllers; Time domain analysis, transient response of first and second order systems; Introduction to nonlinear control; State space analysis, optimal and adaptive control; Intorduction to discrete-time systems and Z-transform.
Design and fabrication of Mechatronics systems.

References :

1. Automatic Control Engineering by F.H.Raven, 5th ed., McGrawHill International.
2. Modern Control Engineering by K.Ogata, 3rd ed., Prentice Hall.
3. Mechatronics, Bolton, Pearson Education
4. Automatic Control Systems by B.C.Kuo, 6th ed., Prentice Hall.
5. Mechatronics , HMT Ltd., TMH.
6. Machine design for mobile and industrial applications by G.W.Kurtz, J.K.Schueller, P.W.Claar, SAE.
7. Mechatronics, Mohali, TMH

ME 603 : Energy Conversion and Management
Contacts : 4L
Credits : 4

Steam Power Plant : Solid, liquid and gaseous fuels, storage and preparation of fuels, fuel bed firing, combustion conditions, suspension firing, draft systems. Steam generators and their types, circulation principles, forced circulation boilers, waterwalls, mountings, and accessories, performance rating of boilers, Feed water conditioning, Fuel and ash handling equipment, dust collectors. Condenser cooling water system. Steam pipes, pipe fittings, lagging, air and gas ducts. Instrumentation and control of steam power plant.
Diesel Power Plant: Equipment of diesel plants, field of applications, fuel - storage and handling, cooling systems.
Nuclear Power Plant: Introduction to nuclear power, types of reactors, heat release rates, steam generation principles.
Use of renewable energy - utilisation of solar, wind, tidal, geothermal resources. Hydroelectric power plants.
Plant economy : Load curve, load factor,capacity factor,utilization factor etc. Investment cost, fixed and annual operating costs, unit cost, tariff, influence of station performance characteristics on costs. Selection and location of plants, comparative study of different plants.

References :

1. Power Plant Engineering by M.M. Elwakil, Tata McGraw Hill
2. Power Plant Engineering by P.K. Nag, Tata McGraw Hill
3. Power Plant Engineering by Domkundwar, Dhanpat Rai

ME 604 : Design of Mechanical Systems
Contacts : 4L
Credits : 4

Design for variable loads: endurance limit, Goodman and Soderberg criteria, Design of shafts, clutches and brakes - calculation of heat generation and heat dissipation; Gears: Gear tooth geometry, tooth systems, gear trains, gear box design, design of helical, bevel and worm gears from strength and wear considerations, Design of Machine Tools Gear Box; Speed and Feed Gear Boxes; Flywheel design, bearings and lubrication, selection procedure of antifriction bearings, journal bearings, hydrodynamic theory, design factors, the relation of the variables, heat balance, hydrostatic bearings. Concept of Concurrent and Simultaneous Engineering Example problems in Design of Mechanical Systems.

References :

1. Computer Aided Mechanical Design and Analysis by V.Ramamurhti, 3rd ed., TMH.
2. Mechanical Analysis and Design by A.H.Burr and J.B.Cheatham, 2nd ed., Prentice Hall.
3. Mechanical Engineering Design by J.E.Shigley, TMH

ME 605 : Dynamics of Machines
Contacts : 3L
Credits : 3

Static and dynamic force analysis; Flywheel; Inertia forces and their balancing for rotating and reciprocating machines; Gyroscope and gyroscopic effects; Governors: types and applications; Cam dynamics: analysis of cam and follower, jump phenomenon; Hydrodynamic and boundary lubrication and analysis of journal and thrust bearings; Vibration of one degree of freedom systems; Free and forced vibrations; Transverse and torsional vibrations of two and three rotor systems; Critical speeds; Vibration isolation and measurements; Two degree of freedom systems; Vibration absorber; Geared system; Multi degree of freedom system.

References :

1. Elements of Vibration Analysis by L.Meirovitch, McGraw Hill.
2. Mechanism and Machine Theory by J.S.Rao and R.V.Dukkipati, New Age International.
3. Theory of Machines and Mechanisms by .Uicker and J.J.Shigley, OUP
4. Theory of Machines by S.S.Rattan, TMH.

ME 692 : Mechatronics and Modern Control Laboratory
Contacts : 3P
Credits : 2

Experiments on
open and closed loop positional control using positional and velocity feedback,
use of analog and digital servosystems,
PID control,
Experiments in pneumatic and hydraulic drives and actuators.
Use of logic gates,
Microprocessor and PLC programming for simple control operations.

ME 694 : Design Practice - II
Contacts : 3P
Credits : 2

Exercises on 2 - D and 3 - D modelling of mechanical components and systems using software packages like AUTOCAD, CATIA, PROE Engg like softwares etc.

ME 695 : Dynamics of Machines Laboratory
Contacts : 3P
Credits : 2

Experiments to be conducted on
Single DOF Vibratory Systems;
Static and Dynamic balancing of rotating masses;
Balancing of reciprocating masses;
Governors;
Gyroscope;
Cam Design, Operation and Analysis.

ME 696 : Thermal Engineering Laboratory - II
Contacts : 3P
Credits : 2

Experiments on C.I. and S.I. engines, measurements of power, efficiency, calorific value of fuels as per course on Paper ME 501 of Semester - V.

ME 699 : Seminar
Contacts : 3S
Credits : 2

Each student will be required to give a seminar talk along with a report on any current topic with audiovisual aids, graphs, charts and models as assigned to them on individual basis.

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SEMESTER - VII

ME 701 : Advanced Manufacturing Technology
Contacts : 3L
Credits : 3

Integrated automation, computers and managerial challenges; modern cutting tools and tool management, CAPP, high speed machining, precision machining;
Non traditional machining: EDM, ECM, USM, PAM, EBM, AJM, WJM, Explosive forming and LBM.
Graphics standards - CAD and CAE, Computer networking, GT concept, FMS, CIM, Computer aided Quality Control, CMM, Application of AI in CAD/CAM/CIM., Reverse Engineering, Rapid Prototyping and Tooling.

References :

1. Non-Conventional Machining by P.K.Mishra, Narosa Publishers.
2. Manufacturing Engineering & Technology, K. Jain, Pearson Education]
3. CAD/CAM, Rao, TMH
4. Manufacturing Science by A.Ghosh, East-West Publications.
5. Non-Traditional Manufacturing by Benidict.
6. Automation, Production Systems and Computer Integrated Manufacturing by Groover, Prentice Hall.
7. CAD/CAM by M. P. Groover and E. W. Zimmers, Prentice Hall of India.
8. Manufacturing Technology,Radhakrishnan,Scitech
9. CAD/CAM,

ME 702 : Advances in Materials Processing
Contacts : 3L
Credits : 3

Introduction to advanced materials: composites, ceramics, refractory metals and alloys, superalloys; Solidification processing: principles of solidification, processing and applications of recent solidification techniques like infiltration techniques, rheocasting, squeeze casting, compocasting, rapid solidification techniques and zone refining; Powder metallurgy processing: Metal and ceramic powder production, characterisation, mixing techniques; Mechanical alloying and process variables; Various compaction techniques and the process variables; Mechanism of sintering and various sintering techniques, viz., solid state sintering, liqui phase sintering, reaction sintering, hot pressing, HIP and self propagating combustion sintering; Recent advances in powder metallurgy like Ospray and Deposition techniques.

References :

1. Fundamentals of Solidification by W.Kurtz and D.J.Fisher, Trans. Tech Publication.
2. Rapidly Solidified Metals by T.R.Anantharaman and C.Suryanarayana, Trans. Tech Publications.
3. Manufacturing Process for Engineering Materials, K. Jain, Pearson Education
4.Modern Ceramic Engineering by D.W.Richardson, Marcel Dekker Inc..

ME 703 : Operations Research and Industrial Management
Contacts : 3L + 1T
Credits : 4

Operations Research: Introduction to OR, definition, linear programming; graphical method, simplex method, dual problem, dual simplex method, transportation and assignment problems, Project Management: CPM and PERT, Queuing theory, Game theory, Markov chain, Monte Carlo Simulation.
Industrial Management: Principles and functions of Management: Leadership and decision making,
Human resources: personnel management, industrial legislation and relations, industrial psychology, manpower planning, training and development, health, safety, welfare, remuneration and incentive schemes.
Materials, Purchase and Stores Management: Inventory control.
Sales and Marketing Management.
Cost Accounting and Control, Budget and Budgetary control.

References :

1. Production Systems: Planning, Analysis and Control by J.L.Riggs, 3rd ed., Wiley.
2. Productions and Operations Management by A.Muhlemann, J.Oakland and K.Lockyer, Macmillan.
3. Operations Research - An Introduction by H.A.Taha, Prentice Hall of India./Pearson Education
4. Operations Research by J.K.Sharma, Macmillan.
5. Operations Research,Vijayakumar,Scitech

HU 701 : Ethics in Engineering Profession
Contacts : 3L
Credits : 3

Science, Technology and Engineering as knowledge and as social and professional activities.
Inter-relationship of technology growth and social, economic and cultural growth; historical perspective.
Ancient, medieval and modern technology/industrial revolution and its impact; the Indian Science and Technology.
Social and human critiques of technology; Mumford and Ellul.
Rapid technological growth and depletion of resources; reports of the club of Rome; limits to growth; sustainable development.
Energy crisis, renewable energy resources.
Environmental degradation and pollution; eco-friendly technologies; environmental regulations; environmental ethics.
Technology and the arms race; the nuclear threat.
Appropriate technology movement of Schumacher; later developments.
Technology and the developing nations; 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 centred technology.
Industrial hazards and safety; safety regulations, safety engineering.
Politics and technology; authoritarian versus democratic control of technology; social and ethical audit of industrial organizations.
Engineering profession; ethical issues in engineering practice; conflicts between business demands and professional ideals; social and ethical responsibilities of the engineer; codes of professional ethics; whistle blowing and beyond; case studies.

HU 702 : Engg. Economy and Financial Management
Contacts : 3L
Credits : 3

Interaction between economic theory and production; concept of firm, industry and economy.
Consumer behavior, utility, indifference curves and maps; consumers' supply, demand function.
Production function, effect of technology, short and long range cost functions, monopoly and competition, determination of price, price discrimination, pricing of products.
Function of financial management and financial executive; nature of risk, interrelationship between risk and return; effect of tax on return.
Analysis and interpretation of standard financial statements.
Concept of operating cycle and working capital management.
Planning of profit and leverage (operating and financial).
Project evaluation indices like NPV, IRR.
Definition and scope of cost accountancy and costing methods; Elements of cost identifications; Recording, ascertainment of direct material and labour cost; Overhead classification, distribution and absorption; Process costing, uniform, marginal and standard costing methods; Case studies showing application of financial management and costing methods.

References :

1. Engineering Economics by E.Paul Degermo.
2. Engineering Economics by James L. Riggs.
3. Engineering Economics, Sullivan, Pearson Education

ME 794 : CAD-CAM Laboratory
Contacts : 3P
Credits : 2

Experiments to demonstrate the features of CNC machines, CNC programming on turning and milling machines,
Study of the geometry of the robot manipulators, actuators, grippers and experiment on robot programming and simple sensor experimentation.
Demonstration of basic CAD-CAM systems, generation of tool path from product geometry using CAD-CAM simulation tools, Robot simulation modelling.

ME 795 : Project
Contacts : 9P
Credits : 6

Students will be exposed to lecture modules on Project and Thesis work followed by assignment of individual projects involving manufacturing/production/design of an engineering product. An industrial project may also be undertaken by the student to be supervised jointly by Industry personnel and the teacher.

ME 798 : Vacational Training
Credits : 2

Students undergoing Vacational training in Semester - VI will be given credit in Semester - VII. Students shall have to submit a report endorsed by the Industry Training Manager/ Lab-in-charge of R & D Organisation.

ME 799 : Seminar on assigned topic
Contacts : 3S
Credits : 2

Each student will be required to give a seminar talk along with a report on any current topic with audiovisual aids, graphs, charts and models as assigned to them on individual basis.

SEMESTER - VIII

ME 801 : Industrial Engineering
Contacts : 3L
Credits : 3

Production Planning and Control; Product: product design, customer requirements, value engineering, quality, reliability, service life, competitiveness;
Plant: location, layout, material handling, equipment selection, maintenance of equipment and facilities;
Processes: Job, batch and flow production methods, Group Technology Work study and Time and Motion study, Work/job evaluation, quality control (SPC), control charts;
Resource planning: production/ operation control, forecasting, capacity management, scheduling and loading, line balancing, break-even analysis, inventory of materials and their control, manufacturing planning, MRP - II, JIT.

References :

1. Production, Planning and Inventory Control by S.L.Narasimhan, D.W.McLeavey, P.J.Billington, Prentice Hall.
2. Production Systems: Planning, Analysis and Control by J.L.Riggs, 3rd ed., Wiley.
3. Productions and Operations Management by A.Muhlemann, J.Oakland and K.Lockyer, Macmillan.

ME 891 : Industrial Engineering Laboratory
Contacts : 3P
Credits : 2

Experiments and computational work involving production planning and scheduling, process planning, resource allocation, machine loading and optimization;
Plant facility layout models, mechanical, electro-analogue models for optimal plant facility location analysis, analogue and computer aided models for physical path analysis of production program/project activity;
Network analysis and optimization; product quality planning and control analysis models; production system simulation, simulated system in maintenance programs, system dynamics, computer applications in Industrial Engineering.

ME 898 : Project / Thesis
Contacts : 12P
Credits : 8

Each student will be assigned any one of the following types of project/thesis work:
(a) Industrial case study
(b) Preparation of a feasibility report
(c) Thesis by experimental research, and
(d) Design and development of equipment.

Each report must contain student's own analysis or design presented in the approved format. Sessional marks will include
(a) Evaluation of the student's progress,
(b) Degree of involvement and participation,
(c) Merit of the project.

A student will have to defend his project/thesis and credit will be given on the merit of viva-voce examination.

ME 881 : Participation in Institutional Activities
Credits : 2

The department will define and assign tasks to the students for various institutional activities and the students will submit necessary reports / oral exam. for the purpose of evaluation.

ME 899 : Comprehensive Viva-Voce
Credits : 3

A student will have to appear at the Comprehensive Viva-Voce examination of all the subjects covering the whole syllabus before a board of examiners including an external expert.

Elective Papers

ME 802 : Computational Heat Transfer
Contact : 3L
Credits : 3

Basic Concept: Governing differential equations, time-averaged equations for turbulent flow, nature of co-ordinates.
Discretization Methods : The discretization concept, methods of deriving discretization equations, discretization error.
Heat Conduction : One dimensional conduction, the basic equations of steady and unsteady conductions, grid spacing, source term linearization, boundary conditions, solutions of linear algebraic equations, Crank - Nicolson and fully implicit schemes, explicit schemes, solutions of algebraic equations, discussions on two and three dimensional heat conduction.

Convection and Diffusion: Derivation of basic equations, different schemes of discretization - upwind, exponential, hybrid and power law schemes, discretized equations and their solutions, examples.

References :
1. Computational Fluid Mechanics and Heat Transfer by J.C.Tannehill, D.A.Anderson and R.H.Pletcher, 2nd ed., Taylor & Francis.
2. Computational Heat Transfer by Y.Jaluria and K.E.Torrance, Springer Verlag.
3. Computational Fluid Mechanics and Heat Transfer by S.V.Patankar, Hemisphere.

ME 803 : Combustion Engineering
Contact : 3L
Credits : 3

Fuels: Chemical thermodynamics; Chemical kinetics and reaction mechanisms, flame propagation, inflammability limits, premixed and diffusion flames, flame stabilisation, radiation of flames, heat and mass transfer with chemical reactions, combustion in fixed, moving and fluidised beds, combustion of pulverized coal, oil, gas and propellants, design aspect of burners and furnaces, Combustion generated pollution.

References: To be added by the concerned teachers.

ME 804 : Reliability Engineering and Plant Maintenance
Contact : 3L
Credits : 3

Basic laws of probability, Conditional probability, Random variable, sample distribution, statistical hypothesis, statistical tests of significance, correlation, regression analysis, autocorrelation, ANOVA, concept of reliability, availability and maintainability (RAM), systems reliability, reliability improvement, design of maintenance systems, spare parts management, Decision Support System, SWOT.

Reference :
1. Mechanical Reliability Engineering by ADS Carter , Macmilan
2. Reliability Evaluation of Engineering Systems by Roy Billington and R.N. Allen, Pitman
3. Introduction to Reliability Engineering by Dhilan & Singh
4. Reliability Engineering by L.A. Doty, Industrial Press Inc.

ME 805 : Tribology and Terotechnology
Contact : 3L
Credits : 3

Introduction to tribological systems and their characteristic features: Physico-mechanical interactions at interfacial contact surfaces; Analysis and assessment of topography; Deterministic and stochastic tribo-models for asperity contact, frictional resistance and wear; Frictional instability and stick-slip phenomenon; Models of aheso-diffusion wear process; Kinetics of solid state interfacial interactions.
Principles of lubrication: Hydro-dynamic, hydro-static, elatso-hydrodynamic cases; Boundary film lubrication; Solid lubricants; Tribological design of machine elements and systems; Principles of life-cycle analysis and their application.
Terotechnology: Introduction, Life cycle cost analysis of plants and concept of tero-technology; Various maintenance management strategies; Production maintenance interface and terotechnology based planning and control; Maintenance policy determination; Fixed time replacement prior to failure; Concept of health and usage monitoring of plants (HUM); Condition based maintenance; Opportunity maintenance; Design out maintenance; Preventive maintenance; Reliability, maintainability and availability of plants and equipments; Replacement strategies, Computer application in terotechnology based critical analyses.

References :
1. Tribology - a System Approah to the Science and Technology of Friction, Lubrication and Wear by Horst Czichos, Elsevier Scientific Publishing Co.
2. Principles of Tribology by Halling J. (Editor), Macmillan, London.
3. Handbook of Tribology: Materials, Coatings and Surface Treatments by Bharath Bhooshan and B. K. Gupta, McGrawhill, New York.

ME 806 : Non-Conventional Energy Sources
Contact : 3L
Credits : 3

Energy scenario and renewable energy sources: Global and Indian situation, potential of non conventional energy sources, economics.
Solar energy: Radiation, flat plate and concentrating collectors, fluid flow and heat transfer analysis, estimation of solar radiation, Active systems, solar pond, passive space conditioning, power generation, photovoltaics.
Principles and applications of wave energy, tidal energy, biomass energy, OTEC and Geothermal energy.
MHD Engineering. Fuel Cells. Wind Energy potentials.

References :
1. Solar Energy Fundamentals Design, Modelling and Applications by G.N. Tiwari, Nwrosh.
2.Power Plant Engineering, Ramalingam.,Scitech

ME 807 : Finite Elements Method and its Applications
Contact : 3L
Credits : 3

Introduction: basic concept of the finite element method, comparison with finite difference method; Variational methods: calculus of variation, the Rayleigh-Ritz and Galerkin methods; Finite Element analysis of 1-D problems: formulation by different approaches (direct, potential energy and Galerkin); Derivation of elemental equations and their assembly, solution and its postprocessing. Applications in heat transfer, fluid mechanics and solid mechanics.Bending of beams, analysis of truss and frame. Finite element analysis of 2-D problems: finite element modelling of single variable problems, triangular and rectangular elements; Applications in heat transfer, fluid mechanics and solid mechanics; Numerical considerations: numerical integration, error analysis, mesh refinement. Plane stress and plane strain problems; Bending of plates; Eigen value and time dependent problems; Discussion about preprocessors, post processors and finite element packages.

References :
1. An Introduction to the Finite Element Method by J.N.Reddy, McGrawHill, NewYork.
2. Concepts and Applications of Finite Element Analysis by R.D.Cook, D.S.Malkus and M.E.Plesha, 3rd ed., John Wiley, New York.
3. The Finite Element Method by O.C.Zienkiewicz and R.L.Taylor, 3rd ed. McGraw-Hill.
4. The Finite Element Method by T.J.T Hughes, PrenticeHall, Englewood Cliffs, NJ.
5. Concepts of finite element method, Selvam, Scitech

ME 808 : Experimental Stress Analysis
Contact : 3L
Credits : 3

Introduction to the theory of elasticity. General principles governing the approach to experimental stress analysis techniques - whole field and point per point information.
Photoelasticity: Light and optics as related to photoelasticity, Theory of photoelasticity, stress-optic relations, model materials, analysis techniques. Three dimensional photoelasticity.
Strain gauge techniques: Various types of strain gauges; Electrical resistance strain gauges, and semi-conductor gauges, Parameters influencing the behaviour, Rosett analysis, Strain gauge circuits, and recording instruments for static and dynamic applications. Introduction to Moire fringes and Grid techniques.

References :
1. Experimental Stress Analysis by Dove & Adam, Mc. Graw Hill
2. Experimental Stress Analysis by Dolley & Raieley, Mc. Graw Hill

ME 811 : Automotive Engineering
Contact : 3L
Credits : 3

Power Plant: Automotive engine classification, S.I. and C.I. engines, combustion chamber types, engine balancing, multicylinder arrangements.
Automobile engine parts: Cylinder block, cylinder head, crank case, oil pan, cylinder liners, piston, arrangements to control piston slap, piston rings, connecting rods, crank shaft, valves, valve actuating mechanism, valves layout, materials used, valve and port timing diagrams.
Fuel supply system: Simple carburetor, constant choke, constant vacuum carburetor, types of carburetor, mixture strength requirements, fuel pumps for petrol engines, petrol injections, diesel fuel pump and fuel injector for diesel engines.
Ignition system: Battery ignition system, comparison between battery ignition and magnetic ignition system, ignition advance methods, electronic ignition.
Cooling system: Necessity, methods of cooling.
Lubrication system: Objectives, system of engine lubrication, crank case ventilation.
Chasis construction: The frame and its functions, layout of the components of transmission system in four wheel rear drive vehicles.
Clutches: purpose, requirements, relative merits and demerits of different types of clutches.
Gear box: Purpose, sliding mesh gear box, constant mesh gear box, power flow diagrams, torque converter, automatic transmission - an overview, calculation for road resistance, tractive power.
Universal coupling, propeller shaft, final drive - types, functions. Differential - purpose, construction.
Rear axle types: semifloating, full floating and three quarter floating construction, working.
Steering mechanisms, steering linkages, steering gears - for rigid front axle and independent front wheel suspension
Brakes: types of brakes, numerical problems relating to brake torque, minimum stopping distance with front wheel braking, rear wheel braking, wheel braking and heat dissipation.
Electrical equipment: Generator, voltage regulator and cut-out, starter, lighting circuit.
Application of CNG in automotive engines.

References :

1. Motor Vehicle by Newton, Steed and Garrette, 2nd ed., Butterworth.
2. Automobile Engineering Vols - I & II by Kirpal Singh, Standard Publishers Distributers.
3. Automotive Mechanics by Heitner Joseph, East west Press.
4. Automotive Mechanics by Crouse, McGrawhill.
5. Automobile Mechanics by N.K.Giri, 7th ed., Khanna Publishers.

ME 812 : Robotics and Robot Applications
Contact : 3L
Credits : 3

Robot definition: Robotic systems - Its role in automated manufacturing; robot anatomy; robot classifications and specifications.
Robot kinematics, forward and reverse transformation, homogeneous transformations.
Robot actuators and control; Pneumatic, hydraulic and electrical drives and controls used in robots.
Robot end-effectors, mechanical, magnetic and vacuum grippers, gripping forces RCC and design features of grippers.
Robot sensors, different types of contact and non-contact sensors; Robot vision and their interfaces;
Robot languages and programming techniques.
Applications of robots in materials handling, machine loading/unloading, inspection, welding, spray painting and finish coating, and assembly, etc.
Economic performance and evaluation strategies, Robt installation and planning.
Safety features.

References :

1. Industrial Robotic Technology - Programming and Application by M.P.Groover et. al., McGrawhill
2. Robotics for Engineers by Y.Koren, McGrawhill.
3. Robots Modelling Control and Applications with Software by P.G.Ranky and C.Y.Ho, Springer Verlag Berlin.
4. Robotics Technology and Flexible Automation by S.R.Deb, TMH.

ME 813 : Management Information Systems
Contact : 3L
Credits : 3

Introduction to Management Information Systems (MIS); Data, information and knowledge concepts, concepts of information representation: storage, dissemination, discrimination and transmission.
Data base management systems, design and implementation of RDBMS for managerial applications, retrieval aspects, security and privacy aspects.
Specification and configuration of computer based systems; Manufacturing Management Information systems - its subsystems and outputs; costing and performance audit applications in MIS.

References :
1. Management Information Systems, Organisation and Technology by Loudon and Loudon, 4th ed., Prentice Hall.

ME 814 : Energy Management and Auditing
Contact : 3L
Credits : 3

General energy problems, Energy use patterns and scope of conservation.
Energy management principles, need, organising, initiating and managing an energy management program.
Energy Auditing: Elements and concepts, type of energy audits, instruments used in energy auditing with respect to industries like sugar, paper, power plant, etc.
Economic analysis: cash flows, time value of money, formulae relating present and future cash flows - single amount, uniform series. Financial appraisal methods: Payback period, Net present value, Benefit - cost ratio, internal rate return and life cycle costs, benefits, numericals.
Thermodynamics of energy conservation, energy conservation in boilers, furnaces, in steam and condensate systems.
Cogeneration: Concepts, types of cogenerating systems, performance evaluation of cogenerating systems.
Waste heat recovery: Potential, benefits, equipment, industrial insulation - materials, selection, economical thickness. Numericals.
Electrical energy conservation: Industrial uses of electrical power, load curve analysis, energy efficient motors, energy conservation - pf improvement methods.

References :
1. Industrial Energy Management and Utilisation by Larry C. Witte, Schmidt and Brown, Hemisphere Publishing Co., New York.
2. Energy Management Hand Book by Wayne C., Turner, Wiley Interscience Publication.
3. Industrial Energy Conservation by D.A.Reay.
4. Thermal Energy Recovery by L.T.Boten, Wiley.

ME 815 : Refrigeration and Airconditioning
Contact : 3 L
Credits : 3

Psychrometry; Heating and cooling- load calculations; Airconditioning systems; Fan and duct systems; Pumps and pumping; Cooling and dehumidifying coils; Air-conditioning controls; Vapour cycles; Compressors; Condensers and evaporators; Expansion devices; Vapour-compression system analysis; Refrigerants; Multipressure systems; Absorption refrigeration; Heat pumps; Cooling towers and evaporative condensers.

References :

1. Refrigeration and Air Conditioning by W.F.Stoecker and J.W.Jones, 2nd ed., McGrawhill International Editions.
2. Thermal Environmental Engineering by J.L.Threkeld, 2nd ed., Prentice Hall Inc..
3. Refrigeration and Airconditioning by C.P.Arora, TMH.

ME 816 : Optoelectronics and Laser Materials Processing
Contact : 3L
Credits : 3

Basic laser optics; Laser: electromagnetic radiation, reflection, refraction, laser beam characteristic, focussing with a single lens, optical component.
Types of lasers - CO_2 laser, CO laser, solid state, diode, excimer lasers, applications of laser; Laser cutting, laser welding, laser surface treatment.
Theory of heat flow, laser automation and in-process sensing, laser safety.

References :
1. Laser Material Processing by William M.Steen, Springer-Verlag.
2. Optical and Optoelectronics ins,prince,Scitech

ME 817 : Gas Turbine Theory
Contact : 3L
Credits : 3

General Considerations of Turbomachinery : Classification; Euler's Equation for Turbomachinery; Velocity Triangle; Cascade analysis & nomenclature. Shaft Power & Aircraft Propulsion Cycles. Centrifugal Compressors: Workdone and pressure rise; Slip; Compressibility effects; Compressor Characteristics. Axial Flow Compressors: Stage pressure rise; Blockage in compressor annulus; Degree reaction; 3-D flow; Stage performance; h-s diagram & efficiency; Off design performance; Performance characteristics; Design process. Combustion System. Axial Flow Turbines: Stage performance; Degree of reaction, h-s diagram & efficiency; Vortex theory; Overall turbine performance; Performance characteristics; Blade cooling; Design process.
Prediction of performance of simple gas turbines; Off Design performance; Gas turbine blade materials; Matching procedure.

References :
1. Fluid Mechanics, Thermodynamics of Turbomachinery, 4th Edition, Pergamon Press, 1998 by S.L. Dixon .
2. Gas Turbine Theory, 4th Edition, Longman, 1998 by H. Cohen.
3. Elements of Gas Turbine Propulsion, McGraw Hill Inc. 1996 by Jack D. Mattingly.
4. Fluid Dynamics and Heat Transfer of Turbomachinery, John Wiley & Sons, Inc. 1996 by Budugur Lakshminarayana.

PE 807 : Computer Integrated Manufacturing
Contact : 3L
Credits : 3

Concept of Computer Integrated Manufacturing (CIM); Basic components of CIM; Distributed database system; distributed communication system, computer networks for manufacturing; future automated factory; social and economic factors.
Computer Aided Design (CAD): CAD hardware and software; product modelling, automatic drafting; engineering analysis; FEM design review and evaluation; Group Technology Centre.
Computer Aided Manufacturing (CAM): Computer assisted NC part programming; Computer assisted robot programming; computer aided process planning (CAPP); computer aided material requirements planning (MRP); computer aided production scheduling; computer aided inspection planning; computer aided inventory planning; flexible manufacturing system (FMS); concept of flexible manufacturing; Integrating NC machines, robots, AGVs, and other NC equipment; Computer aided quality control; business functions, computer aided forecasting.
Management Information Systems (MIS), Various CIM systems - examples.

References :
1. CAD, CAM, CIM by P.Radhakrishnan and S.Subramanyan, New Age International Publishers.
2. Computer Integrated Manufacturing by Paul G. Rankey, Prentice Hall.

3. Computer Integrated Manufacturing by Harrington J. Jr., Industrial Press, Inc., New York.
4. Computer Integrated Manufacturing by K.Rathmill and P.Macconal, IFS Publications.
5. Automation, Production Systems and Computer Integrated Manufacturing by M. P. Groover, Prentice Hall.

IT 806 : Information Technology
Contact : 3L
Credits : 3

Hardware: CPU architecture, memory, registers, addressing modes, buses, instruction sets, multi processors versus single processors;
peripheral devices: hard disks, CDs , video display monitors, device controllers, input/output; operating systems - functions and types;
operating system modules: processes, process management, memory and file system management; examples of hardware architectures; examples of operating systems; basic network components, switches, multiplexers and media; installation and configuration of multi user operating systems.
Data structure and representation: characters, records, files, multimedia; precision of data; information representation, organisation and storage; algorithm development; object representation compared to conventional data flow notation; programming control structures; program correctness, verifications and validations; file structures and representation.
Communication devices, media, systems; network hardware and software; network configuration; network applications; coding of data; cost/benefit analysis; distributed versus centralised systems; architectures, topologies and protocols; installation and operation of bridges, routers and gateways; network performance analysis; privacy, security, reliability; installation and configuration of LAN and WAN networks; monitoring of networks; management of telecommunications and communications standards. Intranet and internet.

References :
1. Computer Architecture and Organisation – John. P. Haryes, Tata McGraw Hill
2. Data Structure and Program Design – Robert L. Kruse, PHI
3. Modern Operating System – Andrew S. Tanenbaum, PHI
4. Data and Computer Communication – William Stallings, PHI

ME 821 : Total Quality Management
Contact : 3L
Credits : 3

Basic concepts, definitions and history of quality control. Quality function and concept of quality cycle. Quality policy and objectives. Economics of quality and measurement of the cost of quality. Quality considerations in design.
Process control: Machine and process capability analysis. Use of control charts and process engineering techniques for implementing the quality plan.
Acceptance Sampling: single, double and multiple sampling, lot quality protection, features and types of acceptance sampling tables, acceptance sampling of variables and statistical tolerance analysis. Quality education, principles of participation and participative approaches to quality commitment.
Emerging concepts of quality management: Taguchi's concept of off-line quality control and Ishikawa's cause and effect diagram.

References :
1. Total Quality Management – An Introductory Text by Paul James, Prentice Hall
2. Quality Control and Applications by Housen & Ghose
3. Industrial Engineering Management by O.P. Khanna

ME 822 : Mechanics of Composite Materials
Contact : 3L
Credits : 3

Basic concepts and characteristics: Definition and characteristics of composite materials, overview of advantages and limitations of composite materials, significance and objectives, sciences and technology, types and classification of typical composite materials, current status and future prospects;
Macromechanical behaviours of lamina: Stress-strain relations for anisotropic materials, engineering constants for orthotropic materials, stress-strain relations for a lamina of arbitrary orientation, biaxial strength theories.
Micromechanical behaviour of a lamina: Mechanics of materials approach to stiffness, elasticity approach to stiffness, comparison of approaches to stiffnes, mechanics of materials approach to strength. Hygrothermal effects: Hygrothermal effects on mechanical behaviours, hygrothermal stress-strain relations, coefficients of thermal and moisture expansion of unidirectional lamina
Macromechanical behaviours of a laminate: Classical lamination theory, lamina stress-strain behaviour, strain and stress variation in a laminate, laminate forces and moments, special cases of laminate, interlaminar stresses, design of laminates.
Manufacture and testing of composite materials: Manufacturing: Stamp moulding, diaphragm forming, thermoforming, filament winding, pultrution, compression moulding, injection moulding.
Testing: Determination of physical properties such as density, fibre volume ratio, void volume ratio, co-efficient of thermal expansion, determination of tensile, compressive and shear properties of unidirectional lamina, determination of interlaminar and intralaminar strength, biaxial testing, characterisation of composites with stress concentration.

References :
1. Mechanics of Composite Materials by R.M.Jones, McGrawhill-Kogakusha Ltd., Tokyo.
2. Engineering Mechanics of Composite Materials by Issac M.Daniel and Ori Ishai, Oxford University Press.
3. Analysis and Performance of Fiber Composites by B.D.Agarwal and L.J.Brotuman, John Wiley & Sons.

ME 823 : Fracture Mechanics
Contact : 3L
Credits : 3

Griffith's theory of brittle failures; Irwin's stress intensity factors;
Linear elastic fracture mechanics: The stress analysis of crack tips, macroscopic theories in crack extension, Instability and R-curves, Crack tip plasticity, K as a failure criterion, Mixed mode of fracture, analytical and experimental methods of determining K;
Elastic plastic fracture mechanics: Crack tip opening displacement, J integrals, crack growth resistance curves, crack tip constraint under large scale yielding, creep crack growth;
Microscopic theories of fracture: Ductile and cleavage fracture, ductile-brittle transition, inter-granular fracture;
Fatigue crack propagation: Fatigue crack growth theories, crack closure, microscopic theories of fatigue crack growth;
Applications of theories of fracture mechanics in design and materials development.

References :
1. Fracture Mechanics - Fundamentals and Applications by T.L.Anderson, CRC Press.
2. Elementary Engineering Fracture Mechanics by D.Brock, Maritinues Nijholf Publishers.
3. Fracture and Fatigue Control in Structures by S.T.Rolfe and J.M.Barson, PHI.
4. Elements of Fracture Mechanics by Prashant Kumar, Wheeles Publishing.

ME 824 : Advanced Sensors for Engineering Application and NDT
Contact : 3L
Credits : 3

Advanced Sensors: Introduction.
Semiconductor sensors: Metal oxide semiconductors, Hall elements.

Silicon sensors: Silicon Planar Technology, Silicon sensors for sensing radiation, mechanical, magnetic and chemical signals.
IC sensors, membrane types of sensors.
Optical sensors: Lasers, photo-detectors, optical fibre.
Microsensors for sensing thermal, radiation, mechanical, magnetic and chemical signals. Smart sensors.
Non Destructive Testing: Introduction, classification of NDT techniques,
Visual examination: Bore-scopes, video devices,
Magnetic particle testing: Operating principle, magnetising technique.
Liquid Penetrating technique: Principle, process description.
Ultrasonic Testing: Definition, advantages and applications, inspection methods.
Radiography: Electromagnetic radiation sources, process description.
Thermography: Infrared theory, contact, non-contact methods.
Accoustic emission testing, eddy current testing,
Leak testing: Bubble emission testing, Air leak testing.
Case studies on defects in casting, rolling, welding, and heat treating.

References :
1. Non Destructive Testing by Warren J.Mcgomnagle, McGrawhill.
2. Non Destructive Testing by Baldev Raj et. al., Narosa Publishing House.

IT 816 : Entrepreneurship and E-business
Contact : 3L
Credits : 3

Introduction: Concept of Entrepreneurship - need and scope for entrepreneurship - Entrepreneur and society - qualities of entrepreneur Risks, relevance and benefits of small scale Industry - definition of tiny, small ancillary industry - prevailing industrial policy of SSI - incentives and benefits of SSI units.
Motivation theories - Maslow, McCllend - Motivation model - need, want, motive and behaviour - attitude towards work - self assessment and goal setting - Achievement, motivation and behaviour measurement, SWOT analysis, TA analysis - Stress and conflict management; coping with uncertainty; creativity and innovation.
Project identification and formulation: Sources of information - opportunity guidance - choice of technology and its evaluation;
consumer behaviour; market survey and research; demand and resource based industry- servicing industry - import substitution- Technoeconomic feasibilty assessment - shortlisting, preliminary project report, detailed project report, assessing viability and feasibility of a report.
Forms of business organisations/ownership - formation of a Company - procedures and formalities for setting up of new industry-sources of information to contact for what and where - subsidies and concessions for SSI - role of State and Central Government Agencies in promotion of Small Scale Industry. Sickness and nursing of sickness in SSI.
Labour Laws - The Factories Act 1948, Minimum Wages Act - Payment of Wages 1936, Workmen Compensation Act, 1923.
Taxation - State and Central - Concessions.
Introduction to e-business; EDI and e-commerce; EDI standard, implementation and Tools; e-commerce imperatives,
e-commerce applications: I - Markets, Customer care, Vendor Management and Extended supply chain management; security aspects - cryptography, digital signature, digital watermarking, secured socket layers, understanding threats to security, securing internet connections, Firewall techniques, electronic payment systems - ATM model, Payment Models, credit card based payment system, 1st virtual banking, e-cash, smart cards; Electronic Data interchange EDI) - Value added networks.

References :
1. Handbook for New Enterpreneurs, EDII, Ahmedabad.
2. Entrepreneurial Development by P.Saravanavel.

CS 815 : Computer Networking and Web based Technology
Contact : 3L
Credits : 3

Evolution of computer networks - LAN and WAN Layered networks, architecture - standards and protocols; Data communication concepts; Network topologies and transmission media. Data link protocols; reliable communication and flow control. Switching and rotuing protocols - circuit and packet switching; centralized and distributed control; congestion control. Medium access techniques - ALOWA, CSMA/CD, IEEE Standard 802 for LAN, satellite and packet radio networks. Inter networking - repeaters, bridges and routers. Case studies - Ethernet, TCP/IP, ISDN, FDDI, ATM. Network reliability and security. Introduction to Open Distributed Systems and Client Server Model. Unix network programming, the socket interface, Remote Procedure Call (RPC). Tools for developing distributed applications. Network management - SNMP protocol. Issues in the design of distributed information systems.
World wide web: basic concepts, www client and web server, HTTP protocol, universal resource locator (URL).
Creating web pages: HTML basics, tags and categories including hyperlinks, images and multimedia. Forms and clickable maps, common gateway interface (CGI) scripts.
Scripting languages: Javascript, Jscript, Perl.
Java: its relevance in the internet scenario, the JAVA virtual machine. The Java language: basic syntax, variable types, control constructs.
Applications and applets: security issues.

References :

1. Computer Network by Andrew S. Tanenbaum, PHI
2. Internet & World Wide Web – How to program – by Deitel, Deitel & Neito, Pearson Education
3. Data Communication & Networking by Behrouz A. Forouzan, TMH
4. Computer Network Theory,Prasad,Scitech

NOTE : New references may be added by the concerned teachers for all the subjects.