PRODUCTION ENGINEERING SYLLABUS

COURSE STRUCTURE IN PRODUCTION ENGINEERING

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 312	Engineering 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 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 396	Electrical Machines Laboratory	0	0	3	3	2
Total of Practical						**10**	**7**
Total of 3rd Semester						**31**	**28**

PRODUCTION ENGINEERING SYLLABUS

COURSE STRUCTURE IN PRODUCTION ENGINEERING

FOURTH SEMESTER

A. THEORY:

A. THEORY							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	CS(PE) 404	Systems Programming and Languages	3	0	0	3	3
2.	PE 401	Production Management	3	0	0	3	3
3.	PE 402	Primary Production Processes	3	0	0	3	3
4.	ME 403	Measurements and Instrumentation	3	0	0	3	3
5.	ME 404	Analysis and Synthesis of Linkages and Machines	3	0	0	3	3
6.	ME 405	Materials Science and 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.	PE 493	Fluid Mechanics 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.

PRODUCTION ENGINEERING SYLLABUS

COURSE STRUCTURE IN PRODUCTION ENGINEERING

FIFTH SEMESTER

A. THEORY:

A. THEORY							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	PE 501	Ergonomics and Work Design	4	0	0	4	4
2.	PE 502	Metal Cutting Principles and Machining Technology	4	0	0	4	4
3.	ME 502	Heat Transfer	3	1	0	4	4
4.	ME 503	Design of Machine Elements	3	0	0	3	3
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.	PE 592	Metal Cutting and Machine Tools Systems Laboratory	0	0	3	3	2
2.	ME 592	Thermal Engineering Laboratory	0	0	3	3	2
3.	ME 593	Design Practice – I	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.	PE 599	Vacational Training					2
Total of Sessional							**2**
Total of 5th Semester						**30**	**28**

COURSE STRUCTURE IN PRODUCTION ENGINEERING

SIXTH SEMESTER

A. THEORY:

A. THEORY							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	PE 601	Machine Tools Systems	4	0	0	4	4
2.	ME 601	Automation, CNC Machines and Robotics	4	0	0	4	4
3.	ME 602	Mechatronics and Modern Control	3	0	0	3	3
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**

PRODUCTION ENGINEERING SYLLABUS

B. PRACTICAL:

B. PRACTICAL							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	PE 692	Ergonomics Laboratory	0	0	3	3	2
2.	ME 692	Mechatronics and Modern Control Laboratory	0	0	3	3	2
3.	ME 694	Design Practice – II	0	0	3	3	2
4.	ME 695	Dynamics of Machines 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.	PE 699	Seminar	0	0	3	3	2
Total of Sessional						**3**	**2**
Total of 6th Semester						**33**	**28**

- Industrial training for 4 weeks as arranged by the Institute during vacation, to be credited in the seventh semester.

COURSE STRUCTURE IN PRODUCTION ENGINEERING

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 and 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.	PE 795	Project	0	0	9	9	6
2.	ME 794	CAD – CAM 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.	PE 798	Vacational Training (for 4 weeks)					2
1.	PE 799	Seminar on assigned topic	0	0	3	3	2
Total of Sessional						**3**	**2**

PRODUCTION ENGINEERING SYLLABUS

Total of 7th Semester	**31**	**28**

COURSE STRUCTURE IN PRODUCTION ENGINEERING

EIGHTH SEMESTER

A. THEORY:

A. THEORY							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	PE 801	Plant Layout and Automated Material Handling	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	3	0	3	3
Total of Theory						**12**	**12**

B. PRACTICAL:

B. PRACTICAL							
	Code	**Subjects**	**Contacts (periods/week)**				**Credit points**
			L	T	P	Total	
1.	PE 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.	PE 881	Participation in Institutional Activities					2
2.	PE 898	Project / Thesis with defence of project	0	0	12	12	8
3.	PE 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 of the following) :*

PE 802	Production Planning and Control
PE 803	Organisation and Management of Production Systems
PE 804	Project Planning and Appraisal
PE 805	Tool and Die Design
ME 804	Reliability Engineering and Plant Maintenance
ME 805	Tribology and Terotechnology
ME 807	Finite Element Method and its Application
HU 806	Human Engineering & Behavioural Science

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

PE 806	Rapid Prototyping and Tooling
PE 807	Computer Integrated Manufacturing
ME 811	Automotive Engineering
ME 812	Robotics and Robot Applications
ME 813	Management Information Systems
ME 816	Optoelectronics and Laser Materials Processing
ME 824	Advanced Sensors for Engineering Applications and NDT
IT 806	Information Technology
CS 814	Artificial Intelligence and Machine Vision

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

PE 808	Forecasting and Marketing Management
PE 809	Enterprise Resource Planning (EPR)
PE 810	Manufacturing Simulation
ME 821	Total Quality Management
IT 816	Entrepreneurship and E-Business
CS 815	Computer Networking and Web Based Technology
HU 812	Production and Managerial Economics

PRODUCTION ENGINEERING SYLLABUS

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**

WEST BENGAL UNIVERSITY OF TECHNOLOGY

U.G. STRUCTURE FOR B.TECH PROGRAMME
DETAILED SYLLABI OF PRODUCTION ENGINEERING

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 by Victor L.Streeter.
4. Fluid Mechanics by Frank M. White.
5. Introduction to Fluid Mechanics by James A.Fay.
6. Fluid Mechanics and Hydraulics by J. Lal.
7. Fluid Mechanics by A.K.Jain.

ME 312 : Engineering Thermodynamics
Contacts : 4L
Credits : 4

Introduction; Survey of units and dimensions;Zeroth Law; forms of energy and energy interaction; heat and work; State postulate; 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.
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.
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 cyle, Rankine cycle,Work ratio, Reheat and Regenrative Cycles used in steam Power Plants.
Reversed carnot cyle - Vapour and air refrigeration cycles; absorption refrigeration cycles.
Second Law Analysis of reacting systems
Third Law of thermodynamics.

References :

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

Code: M 303 Mathematics
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.
2. Introduction to Solid Mechanics by I.H.Shames, 2nd ed., Prentice Hall.
3. Strength of Materials Vols - I & II by S.P.Timoshenko, CBS Publishers
4. 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. CAD/CAM Theory and Practice by Ibrahim Zeid, TMH
3. Mathematical Methods for Computer Graphics by Rogers and Adams, McGraw Hill
4. Principles of Interactive Computer Graphics by William M.Newman and Robert F.Sproull, 2nd ed., McGrawhill.

EE 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. 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.
Drawing Board exercises are to be done along with Computer Aided Drafting.

PRODUCTION ENGINEERING SYLLABUS

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.

EE 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

CS(PE) 404 : Systems Programming and Languages
Contacts : 3L
Credits : 3

Machine and assembly languages for computers. Elements of assemblers, macrolanguages, compilers and operating systems. Elements of computer organization and architecture. Computer communication and data transfer.
Networks : Protocols, Data Structures, Data Base systems for manufacturing and design, Distributed data processing, Computer programming using JAVA, Visual Basic and other languages.
The students are to be exposed to practice on computer systems programming.

References :

1. System Programming by J.J. Donovan, TMH.
2. System Programming & Operating System by D.M. Dhamdhare, TMH.
3. Computer System Architecture by M. Morris Mano, PHI.
4. Data Communication and Network by William Stalling, PHI.
5. Operating System by William Stalling, PHI.
6. The Complete Reference Java-2 by Herbert Schild, TMH.

PE 401 : Production Management
Contacts : 3L
Credits : 3

Management functions, Evolution of Management Theory, Management approach to Planning, Analysis and Control functions involved in a Production System; Production cycles, planning functions; Types of industry : Job, Batch, Continuous, Mass and Flow Productions; Organisation and policies in respect of production planning and control; Product design and development; Forecasting techniques; Scheduling, Sequencing and plant loading for optimal utilization; Queueing models and line balancing; Materials Planning and Control, Inventory Management; Value Analysis; Productivity Analysis, Mechanics of production control.

References :

1. Production and Operations Management by S.N. Chary, TMH.
2. Essentials of Management by Koontz & Weihrich, TMH.
3. Modern Production / Operations Management by E.S. Buffa and R.K. Sarin, John Wiley & Sons.

PE 402 : Primary Production Processes
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 Technology: Foundry, Forming and Welding by P.N.Rao, TMH.
2. Principles of Manufacturing Materials and Processes, James S.Campbell, TMH.
3. Welding Metallurgy by G.E.Linnert, AWS.
4. Production Engineering Sciences by P.C.Pandey and C.K.Singh, Standard Publishers Ltd.
5. Manufacturing Science by A.Ghosh and A.K.Mallick, Wiley Eastern.

PRODUCTION ENGINEERING SYLLABUS

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.

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 synthesis of machine elements, Freudenstein's equation, Dimensional synthesis 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. Mechanical Metallurgy by G.E.Dieter, McGrawhill.
4. Physical Metallurgy Principles by R.E.Reedhill, East-West Publishers.
5. Principles of Materials Science by W.F.Smith, 3rd ed., McGrawhill.
6. Steel and its Heat Treatment by K.E.Theling, Butterworth.
7. Material Science by J. C. Anderson, K. D. Leaver, R. D. Rawlings and J. M. Alexander, Chapman Hall, 4th Ed., 1992.

PE 493 : Fluid Mechanics Laboratory
Contacts : 3P
Credits : 2

Fluid flow measurements: Coefficient of discharge for venturimeter, orificemeter, nozzlemeter, weirs.
Flow through pipes : Determination of pipe friction in laminar and turbulent flow redimes, Pitot tube experiments on viscous flow and boundary layer theory.
Applications : Experiments on Fluid Machinery : Pumps and Turbines, Compressors and Blowers.

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 Process 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 : 3P
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

SEMESTER - V

PE 501 : Ergonomics and Work Design
Contacts : 4L
Credits : 4

Defining Human Factors in a Production System; Characteristic features of man-machine system; human performance and performance reliability; Human Sensorimotor systems,stimulus dimensions, human information processing, noise and theory of signal detection (TSD); Quantitative and qualitative visual displays; human factors associated with speech communication; Introduction to biomechanics and bio-

engineering aspects of human motor activity; Performance of body members in making different types of movments; Energy expenditure in physical activities; Spatial movments and conceptual relationships of stimuli and responses; Continuous control systems; Types of control functions, tools and related control devices.
Design of work place and work components; Applied anthropometry, activity analysis; Design of Work Place; Human performance under heat, cold, illumination, vibration, noise, pollution, static and dynamic conditions.
Application of results from human factors data and analysis in work study; Work design; method Study and Work Measurement Techniques.

References :

1. Human Factors Engineering by M S Sanders and McCormick, TMH
2. Handbook of Human Factors and Ergonimics by G. Salvendy, John Wiley & Sons
3. Ergonomics – How to design for ease and efficiency by KHE Kroemer, Prentice Hall Englewood Cliffs.
4. Indian Adaptation – Introduction To Workstudy ILO, Geneva, Oxford & IBH Pub. Co. Pvt. Ltd.
5. Ergonomics at Work by Murrell

PE 502 : Metal Cutting Principles and Machining Technology
Contacts : 4L
Credits : 4

Principles of Metal Cutting: Tool Materials, Tool Geometry (ASA, ORS Systems), mechanisms of chip formation, Cutting forces, cutting Temperatures, Tool wear and Tool life, Surface finish and machinability, optimization of cutting parameters,Tool path generation and machining principles, Setting and machining operations on metal cutting machine; 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: Machining on capstan and turret lathes; Mass production: Machining on single/multi spindle automats,
Finishing: microfinishing operations like honing, lapping, superfinishing.

References :

1. Fundamentals of Metal Cutting Machine Tools by G.Boothroyd, TMH.
2. Production Technology, HMT Publication, TMH.
3. Metal Cutting Theory & Practice by A.Bhattacharya, Central Book Publisher, Calcutta
4. Manufacturing Science by A.Ghosh and A.K.Mallik, Wiley Eastern.
5. Manufacturing Process by Maslov, Mir Publishers.

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, dfeinition 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, nondiemnsionalisation, 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. Heat Transfer by J.P.Holman, 8th ed., McGrawhill.
3. Elements of Heat & Mass Transfer by Vijay Gupta, 2nd ed., New Age International Publishers.
4. Heat Transfer - A Basic Approach by M.N.Ozisik, McGrawhill.

PRODUCTION ENGINEERING SYLLABUS

ME 503 : Design of Machine Elements
Contacts : 3L + 1T
Credits : 4

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. Design of Machine Elements by M.F.Spotts, Prentice Hall.
3. Mechanical Analysis and Design by A.H.Burr and J.B.Cheathak, 2nd ed., Prentice Hall.

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.

PE 592 : Metal Cutting and Machine Tools Systems Laboratory
Contacts : 3P
Credits : 2

Study of speed structure (Ray Diagram) of lathes, determination of apron constant, measurement of cutting forces and tool wear experiments are also to be done to study principles of metal cutting; Alignment tests of drilling machines, quick return motion mechanism on shaper are to be undertaken;Laboratory exercises involving machining of complex product configurations,machining of spur and helical gears, copying and contouring, finishing processes and grinding of tools and cutters are to be done.

ME 592 : Thermal Engineering Laboratory
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 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.

PE 599 : Vacational Training
Credits : 2

PRODUCTION ENGINEERING SYLLABUS

Vacational Training (min. duration of four weeks) at the end of Semester IV, credit is to be given in Semester VI.

SEMESTER VI

PE 601 : Machine Tools Systems
Contacts : 4L
Credits : 4

Principles of generation of various surfaces in Machine Tools; Conformable kinematic synthesis for tracing, forming, enveloping and generation; kinematics structure of geared and stepless dirves for machines; designing discrete step drives for machine tools speeds and feeds; Stepless drives;Design principles of machine tool gear boxes; Hydraulic and Electric drives and control; Machine-tool structures: principles of design. Machine Tool vibration and stability control. Principles of design of Machine Tool elements like bearings, spindles and slides; Automation and Control features of Machine Tools; Special tools and attachments. Elements of unit-built machines and Transfer Lines; Selection and acceptance testing of machine tools.

References :

1. Principles of Machine Tools by A. Bhattacharya and G. Sen, Central Book Agency, Kolkata.
2. Machine Tool, Vol - I, II, III, IV by Acharkan, Mir Publishers.

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

Basic principles of automation; Extending the capabilities of conventional machines through improved devices and manipulators;Basic principles of numerical control; CNC, DNC and Machining Centres; Methods of coding and programming; APT programming; Adaptive control; Economics of numerical control.
Introduction to Robotics: Synthesis of elements with movability constraints; Elements of robot anatomy; Hydraulic, pneumatic and electrical manipulators; End-effectors and their design; Controllers with microprocessors or fluidics; Robot Sensors; Applications of industrial robots; Economics of robotics.

References :

1. Introduction to Robotics by J.J.Craig, Addison-Wesley.
2. Robotics for engineers by Y.Koren, McGrawhill.
3. Robotics Technology and Flexible Automation by S.R.Deb, TMH.
4. CNC Machines by N.K.Tewari, Kundra and P.N.Rao.

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

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, 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. 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, McGrawhill.

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 degrees 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 J.J.Shigley and J.J.Uicker, McGrawhill.
4. Theory of Machines by S.S.Rattan, TMH.
5. Theory of Vibration by Thompson.

PE 692 : Ergonomics Laboratory
Contacts : 3P
Credits : 2

Experiments involving :
Work Study; Work Measurement; Anthropometry; Kinesiology; Comfort Analysis; Fatigue; and Bio-engineering etc are to be done.

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

Experiments on
(i) open and closed loop positional control using positional and velocity feedback,
(ii) use of analog and digital servosystems,
(iii) PID control,
(iv) 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 assembly systems using software packages like AUTOCAD, CATIA etc.

ME 695 : Dynamics of Machines 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.
Experiments on single DOF vibratory systems; Static and dynamic balancing of rotating masses; Governors, Gyroscope; Cam Design and Analysis

PE 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.

SEMESTER – VII

PRODUCTION ENGINEERING SYLLABUS

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., Rapid Prototyping and Tooling.

References :

1. Non-Conventional Machining by P.K.Mishra, Narosa Publishers.
2. Manufacturing Science by A.Ghosh, East-West Publications.
3. Non-Traditional Manufacturing by Benidict.
4. Non-Traditional Machining by Dr. A. Bhattacharya, The Institution of Engineers (Calcutta)
5. Automation, Production System & Computer Integrated Manufacturing by M.P. Groover, Pearson Education.

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, liquid 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. 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.
4. Operations Research by J.K.Sharma, Macmillan.

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.

References ;

1. Ethics in Engineering Profession by Prof. S.K. Chakraborty, IIM-Joka

HU 702 : Engineering 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. Modern Microeconomics by A. Koutsoyiannis
4. Financial Management by Prasanna Chandra
5. Cost Accounting by Khan & Jain

PE 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 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, grippers and exercises on robot programming.
Demonstration of basic CAD-CAM systems, generation of tool path from product geometry using CAD-CAM simulation tools, Robot simulation modelling.

PE 798 : Vacational Training
Credits : 3

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

PE 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

PRODUCTION ENGINEERING SYLLABUS

PE 801 : Plant Layout and Automated Material Handling
Contacts : 3L
Credits : 3

Objectives of Facility Design : Types of layout problems, the layout function; organisation of layout: Product, process, Group Layout.
Process design, product analysis, Computerised process planning; Analysis and design of Material flow: Systems approach to flow cycle, flow possibilities, facility layout, process charts, string diagram, flow process chart; quantitative analysis of material flow; line balancing techniques, optimal material flow configuration.
Space and area allocation for production and physical plant service; Computerised handling of layout algorithms;
Introduction to various Mechanical Handling Systems and equipment for handling unit load and bulk materials, namely pulley blocks, winches, electric hoists, EOT cranes, belt conveyor, Bucket elevator, Screw conveyor and pneumatic conveyor. Kinematic analysis and design procedures of their component mechanisms. Design concept of warehouse facilities commensurate with adopted kind of handling and transfer devices; Concepts of AGVs, AS/RS and other automated materials handling devices. Automated packaging devices; design of Integrated Plant Layout for Product Handling Systems.

References :

1. Plant Layout and Material Handling by James M. Apple, John Wiley & Sons.
2. Facility Layout and Location – An Analytical Approach by Richard L. Francis & John A. White, Prentice Hall
3. Material Handling Systems Design by James M. Apple, John Wiley & Sons.
4. Ergonomic Design of Material Handling Systems by Kroemer, KHE Lewis
5. Materials Handling (Principles & Practice) by Allegri, T.H., CBS

PE 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 Plant Location and Layout.

PE 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.

PE 898 : Project / Thesis with Defence of Project
Contacts : 12S
Credits : 8

Each student will be assigned any of the following 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,

PE 899 : Comprehensive Viva Voce
Credits : 4

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

Elective Papers

PE 802 : Production Planning and Control
Contacts : 3L
Credits : 3

Demand forecasting: Long and short term demand forecasting methods, Regression analysis and Smoothing methods. Estimation of trend, cycle, seasonality components. Analysis of forecast error and computer control of forecasting systems. Plant location, capacity scheduling, Warehouse location and capacity scheduling; Multiple Plant Production Facility Design. Aggregate Planning and Master Production Planning and Scheduling;

PRODUCTION ENGINEERING SYLLABUS

Operations scheduling and Control: Basic Sequencing and scheduling techniques, Despatching rules; Chasing and updating of Production Schedules.
Design of Production Planning and Control Systems: System Design for continuous and intermittent Production Systems; Integration of Master Production, Material Requirement and Shop Scheduling Systems. Diagonistic Analysis of Production Planning and Control Systems: Techniques of analysis and evaluation of system performance.

References ;

1. Production Systems Planning Analysis & Control by James L. Riggs, John Wiley & Sons
2. Modern Production / Operations Management by Elwood S. Buffa, Rakesh K. Sarin, John Wiley & Sons
3. Production / Operations Management : Concept, Structure & Analysis by Tersine R.J., North Holland

PE 803 : Organisation and Management of Production Systems
Contacts : 3L
Credits : 3

Definition and models of organisation.
Interaction of organisation structure and management through flow of information; Role of behaviuoral science in developing organisation structure; design of information systems organisation; Marketing of products and services; Business policy and industrial systems dynamics; Introduction to cybernetic applications;
Establishment and evaluation of performance standard for different design; comparative study in terms of economics, efficiency, and utilisation points of view of all resources. Job evaluation, merit rating as applied to production systems. Emerging issues in Management of production systems in the context of recent technological developments.

References :

1. Production & Operations Management by S.N. Chary
2. Essentials & Management by Koontz and Weihrich
3. Management by Stoner, Freeman & Gilbest.

PE 804 : Project Planning and Appraisal
Contacts : 3L
Credits : 3

Project Definition : Venture analysis, Project management Features;
Project organisation design; Operation planning and resource allocation; Plant location analysis models; Project scheduling; Gantt charts; Analysis of project networks - PERT and CPM. Scheduling under Resources constraint, Cash scheduling to multi-projects situation Project monitoring and control aspects; Decision making theories in Management under certainty, risk, uncertainty and competitive situations; applications of the methodologies and formulations in such project decision making problem solutions; Project capital, cost estimation; Breakeven Analysis, Cost Benefit Analysis; Profitability Analysis, Commercial and notional profitability.
Project Engineering, procurement, storage and construction functions and other related management problems; Project wind up and technological obsolescence; Computer aided Project Management.

References :

1. Operations Research – An Introduction by Taha
2. Principles of Operations Research with Applications to Managerial Decision by Wagner

PE 805 : Tool and Die Design
Contacts : 3L
Credits : 3

Evolution of an wedge for chip formation; Tool Geometry; Tool-in-hand, Tool-in-machine and other referencing systems of tool nomenclature; Design of single point cutting tools; design of Tool tips and chip breakers; Layout of circular form tools; Design of milling cutters, form milling cutters and broaches; Development of high production rate tools and drills; Kolesov tool; bykov tool; Zhirov point drill, psiro-point drill.
Principal design features of different forming dies; Design of extrusion, drawing and forging dies; Roll Pass Design; design of moulds, gating and riser systems for plastics and die design for plastic components.

References :

1. Fundamentals of Tool Design – ASTME, PHI
2. Tool Design by C. Donaldson & G. H. Lecain and V.C. Goold TMH
3. Metal Cutting Theory and Practice by Prof. A. Bhattacharya, Central Book Publisher.
4. Technology of Gear Cutting by Prof. A. Bhattacharya & Prof. S.R. Deb. The Institution of Engineers, kolkata.

PRODUCTION ENGINEERING SYLLABUS

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

Reliability: Definition and basic concepts; Failure data, failure modes, and reliability in terms of hazard rate and failure density function; Hazard models and bath tub curve; applicability of Weibull distribution. Reliability calculations for series, parallel and parallel-series systems; Reliability calculations for maintained and stand-by systems.
Maintenance - its role and scope in total organisational context. Objectives and characteristics of maintenance; basic guidelines for design of organisation structure for maintanence; Centralised vs decentralised maintenance; Types of maintenance - corrective, planned, preventive and predictive maintenance; Factors affecting maintenance; opportunistic maintenance; Measurement of maintenace work; rating and allowances. Maintenance cost budgets. Maintenance planning and scheduling; MIS in maintenance; Measurement of maintenance effectiveness and maintenance audit.

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. Reliabilities for the Technologies by L.A.Doty, Industrial Press Inc.

ME 805 : Tribology and Terotechnology
Contacts : 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.
4. Terrotechnology Reliability Engineering & Maintenance Management by Prof. S.K. Basu & Prof. B. Bhadury

ME 807 : Finite Element Method and Its Applications
Contacts : 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.

HU 806 : Human Engineering and Behavioural Science
Contacts : 3L
Credits : 3

Human factors - Anthropometry, principles of motion economy as related to the use of human body, principles of motion economy as related to the design of tools and equipment;
Role of behavioural Science in Man management : Important sociological and psychological theories governing individual and group behaviour; Industrial psychology and various models for analysing effective work behaviour of human beings in organisations; Mc-Gregor's Theory X, Theory Y and Human resource model of man management; Howthrone studies.

Measurement technique for organisation Behaviour research: Models of organisation behaviour analysis; SOBO model; concept of MBO, Various motivation theories and learning process.
Group Dynamics studies: Modern organisation theory and design; Organisation Development (OD), personnel development.
Organisational communication and related models; Conflict and stress management; Leadership processes and styles. Effective management of people and enterprise both in the private and public sectors.

References :

1. Human Behaviour at Work by Keith Devis TMH
2. Industrial Engineering Management by O.P. Khanna
3. Organisation Behaviour by S Robbins

PE 806 : Rapid Prototyping and Tooling
Contacts : 3L
Credits : 3

Current Trends in Design and Manufacturing; the role of Rapid Prototyping and Rapid Tooling; General features and classifications of Generative Manufacturing Processes.
Two dimensional Layer by Layer Techniques : Stereo Lithography with photopolymerisation, liquid thermal polymerisation, solid foil polymerisation, selective laser sintering, selective powder binding, ballistic particle manufacturing, fused deposition modelling, shape melting, laminated object manufacturing, solid round curing, repeatative masking and deposition.
Three Dimensional Techniques for Rapid Prototyping : Beam Interference Solidification, Ballistic particle manufacturing, Holographic Interference Solidification.
Rapid Tooling : Techniques and procedures; Economics of Rapid Prototype and Rapid Tooling.

References :

1. Rapid Prototyping - A Brief Introduction by Amitabha Ghosh, East West Publishers.

PE 807 : Computer Integrated Manufacturing
Contacts : 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; office automation.

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. Robotics Technology and Flexible Automation – S.R. Deb, TMH

ME 811 : Automotive Engineering
Contacts : 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
Contacts : 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, Robot 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
Contacts : 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.
2. Management Information Systems by James Obien

ME 816 : Optoelectronics and Laser Materials Processing
Contacts : 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. A Text Book on Light ;by K.G. Mazumdar, Modern Book Agency Private Ltd.
2. A Text Book on Optics by Subramanyan and Brijlal, Schand & Company Ltd.
3. Laser Material Processing by William M.Steen, Springer-Verlag.

ME 824 : Advanced Sensors for Engineering Application and NDT
Contacts : 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.
3. Sensors & Transducers by D. Patranobis, TMH

IT 806 : Information Technology
Contacts : 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.
Telecommunication 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

CS 814 : Artificial Intelligence and Machine Vision
Contacts : 3L
Credits : 3

Artificial Intelligence: Introduction to AI, Formalized symbolic logic: Rule based deduction and expert systems; Languages for AI problem solving; structured knowledge representation; uncertainty and approximate reasoning; searching and matching; expert system architecture and tools; natural language processing; learning systems.
Machine Vision: Introduction to Machine Vision, sensing and digitizing function in machine vision, illumination techniques.
Image storage, image processing and analysis: Image date reduction, segmentation, feature extraction, object recognition, perspective transformation.
Camera model, camera calibration.
Object recognition in 2-D plane.
Stereo Imaging process: 3-D object recognition, robotic applications.

References :

1. Principles of Artificial Intelligence by N.J.Nilsson, Kaufmann.
2. Introduction to AI and Expert Systems by D.W.Patterson, Prentice Hall.
3. Image Processing, Analysis and Machine Vision by Milan Sonka, Vaclav Hlavac, Roger Boyle, 2nd Edition, PWS Publishers.
4. Robotics (Control, Sensing, Vision and Intelligence) by K. S. Fu, R. C. Gonzalez and C. S. G. Lee, McGrawHill Publications.

PE 808 : Forecasting and Marketing Management
Contacts : 3L
Credits : 3

Demand forecasting ; Long and short term demand forecasting methods. Regression Analysis and smoothing methods; Estimation of trend, cycle,seasonality components. Analysis of forecast error and computer control of forecasting systems.

Basic concepts of marketing, Product, Price, Promotion and Distribution; building customer satisfaction, strategic planning, marketing planning, MIS and marketing research, consumer behaviuor, marketing mix, business and competition analysis; Brand Management, Sales Promotion and Public Relations.
Performance Evaluation of Marketing Programmes, global marketing, Rural Marketing, Industrial Marketing.

References :

1. Managerial Economics by Peterson & Lewis
2. Marketing Management by Philip Kotler

PE 809 : Enterprise Resource Planning
Contacts : 3L
Credits : 3

Enterprise Resource Planning : Basic issues, approach and data base implementation. ERP modules ; Production Planning, Sales and Distribution, Materials Management, Plant maintenance, Quality management, Project Management, Financial and Costing and Human Resources; ERP implementation : Strategy and steps; Business Games, Case Studies in ERP Implementation;
Concept of Supply Chain and its major components.

References :

1. Enterprise Resource Planning by Ravishankar & S. Jaiswal, Galgotia

PE 810 : Manufacturing Simulation
Contacts : 3L
Credits : 3

Discrete System Simulation, Generation of Pseudo Random Numbers, Monte Carlo simulation - Examples, Queuing model, Inventory Control models using QUEST; Simulation Languages such as GPSS, CNC Languages, Planning for NC Path Generation using Espirit, Mastercam etc, CAPP, Robotic Languages; Robot Programming: PTP and CP, Path Generation of Robots and Obstacle Avoidance, ANN, Manufacturing examples, Fuzzy logic and examples in manufacturing, use of Petrinet in Assembly.

References :

1. System Simulation by Geoffrey Gordon PHI
2. Computer Control of Manufacturing Systems by Yoram Koren, McGraw – Hill Book Company
3. Neural Network and Fuzzy Systems – A Dynamical Systems Approach to Machine Intelligence by Bart Kosko, PHI

ME 821 : Total Quality Management
Contacts : 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

IT 816 : Entrepreneurship and E-Business
Contacts : 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. E-business and IS Solutions by William J. Buffam (LPE) Pearson Education
2. Handbook for New Enterpreneurs, EDII, Ahmedabad.
3. Entrepreneurial Development by P.Saravanavel.
4. Organisational Behaviour by S. Robbins
5. E-commerce – A Managerial Perspective by P.T. Josheph, PHI

CS 815 : Computer Networking and Web-Based Technology
Contacts : 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

HU 812 : Production and Managerial Economics
Contacts : 3L
Credits : 3

Interaction between economic theory and production and managerial decision making; concept of firm, industry and economy.
Consumer behaviour, utility, indifference curves and maps; consumer' supply, demand determinations, demand function.
Production function, economy of scale, effect of technology, equilibrium condition, optimal expansion path. Short and long range cost functions.
Perfect competition and monopoly, equilibrium of firm and industries, different models of firm.
Determination of price, price discrimination, pricing of joint products.

References :

1. Modern Micro Ecomomics by Kou.
2. Managerial Economics by Peterson & Lewis

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