BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ORISSA
ROURKELA

Course Structure & Syllabus for 1st year(2010-admission batch) B.Tech Programme

1st Semester				2nd Semester			
Theory		**Contact Hours**		**Theory**		**Contact Hours**	
Code	Subject	L-T-P	Credit	Code	Subject	L-T-P	Credit
BS1101 Mathematics-I		3- 1- 0	4	**BS1104** Mathematics-II		3- 1- 0	4
BS1102 Physics – I Or **BS1103** Chemistry-I		3- 0- 0	3	**BS1103** Chemistry-I Or **BS1102** Physics – I		3- 0- 0	3
BE2101 Basic Electronics Or **BE2102** Basic Electrical Engineering		3- 0- 0	3	**BE2102** Basic Electrical Engineering Or **BE2101** Basic Electronics		3- 0- 0	3
BE2103 Thermodynamics Or **BE2104** Mechanics		3- 0- 0	3	**BE2104** Mechanics Or **BE2103** Thermodynamics		3- 0- 0	3
HM3101 English Communication Skills		2- 0- 0	2	**HM3102** Business Communication		2- 0- 0	2
BE2105 Programming in 'C'		3- 0- 0	3	**BE2106** Data Structure using 'C'		3- 0- 0	3
	Theory Credits		18		**Theory Credits**		18
Practical/ Sessional				**Practical/ Sessional**			
BE7101 Engineering Drawing Or **BE7102** Workshop Practice		0- 0- 3	2	**BE7102** Workshop Practice Or **BE7101** Engineering Drawing		0- 0- 3	2
BE7103 Physics Laboratory Or **BE7104** Chemistry Laboratory		0- 0- 3	2	**BE7104** Chemistry Laboratory Or **BE7103** Physics Laboratory		0- 0- 3	2
BE7105 Basic Electronics Laboratory Or **BE7106** Basic Electrical Engg. Lab		0- 0- 3	2	**BE7106** Basic Electrical Engg. Lab Or **BE7105** Basic Electronics Laboratory		0- 0- 3	2
BE7107 'C' Programming Laboratory		0- 0- 3	2	**HM7102** Business Communicative Lab.		0- 0- 3	2
HM7101 Communicative English Lab.		0- 0- 3	2	**BE7108** Data Structure using 'C' Lab		0- 0- 3	2
Practical/Sessional Credits			10	**Practical/ Sessional Credits**			10
TOTAL SEMESTER CREDITS			28	**TOTAL SEMESTER CREDITS**			28
TOTAL CUMULATIVE CREDITS			28	**TOTAL CUMULATIVE CREDITS**			28

BS1103 <u>CHEMISTRY – I</u>   (3-0-0)

<u>Module – I</u>

(To develop basic concepts of quantum mechanics and its applications in bonding)

Structure & Bonding: Dual nature of matter, Schrodinger equation (need not be derived), interpretation of wave functions, molecular orbital theory of diatomic molecules, metallic bonding.

(No. of Lectures = 7)

Phase rule: Phase diagram of one & two component systems,H_2O, S, Cd-Bi and Fe-C systems.

(No. of Lectures = 5)

Solid State: Crystal systems, Bravais lattices, closed packed structures, ionic solids, and crystal defects including Schottky and Frenkel defects.

(No. of Lectures=4)

<u>Module – II</u>

(To develop basic concepts about the rates of reactions and catalysis)

1.   Reaction Kinetics & Catalysis:

Rate law, Order & Molecularity, Determination of order of reaction, Kinetics of Zero, 1st and 2nd order reactions, Collision theory, theory of absolute reaction rates, Energy of activation, Homogeneous & Heterogeneous catalysis (a general idea)

(No. of Lectures= 7)

2.   Electrochemistry: Electrochemical cells, EMF, Measurement of EMF, Relation between   EMF & free energy change of cell reactions, Electrode potentials and measurements with reference to standard hydrogen electrode, calomel electrodes, determination of pH, dry cells, storage cells and fuel cells.

(No. of Lectures= 7)

<u>Module – III</u>
(Applications of thermodynamic principles to chemical systems)

1.   Chemical thermodynamics: Thermo chemistry, Thermo-chemical calculations based on Hess's law and Born-Haber cycle, second law of thermodynamics, Entropy.

2.   The free energy concepts, applications to gases, Gibbs Helmholtz equation, free energy change and criterion of spontaneity and equilibrium of chemical reactions, chemical equilibrium, Maxwell's relations.

(No of Lectures= 9)

Text Books:

1. Physical Chemistry by G.M. Barrow, 6th edition, Tata McGraw Hill, New Delhi.
2. Physical Chemistry by P.W. Atkins, 5th / 6th edition Oxford.

Reference Books:

1. Principles of Physical Chemistry by Puri, Sharma and Pathania.

2. Physical Chemistry by Bahl and Tuli.
3. Engineering Chemistry by Jain and Jain (15th edition).
4. Physical Chemistry-Thomas Engel, Philip Reid by Pearson Education.

BE7104   **Chemistry Laboratory**   (0-0-3)

(Any ten experiments may be done)

1. Determination of amount of sodium hydroxide and sodium carbonate in a mixture.
2. Determination of total hardness of water by EDTA method.
3. Estimation of calcium in limestone.
4. Determination of percentage of available chlorine in a sample of bleaching powder.
5. Preparation of Phenolphthalein.
6. Preparation of Aspirin.
7. Preparation of buffer solution and determination of pH of a buffer solution.
8. Standardization of $KMnO_4$ using sodium oxalate.
9. Determination of Ferrous iron in Mohr's salt by potassium permanganate.
10. Determination of partition coefficients of iodine between benzene and water.
11. Determination of rate constant of acid catalysed hydrolysis reaction.
12. Determination of concentration of a coloured substance by spectrophotometer.
13. Determination of dissolved Oxygen in a sample of water.
14. Determination of Viscosity of a lubricating oil by Red wood viscometer.
15. Determination of Flash point of a given oil by Pensky_Marten's flash point approach.

BS1102   PHYSICS – I   (1st year)

Module – I   (15 hrs)

		Lectures Hours
Unit- I	**Oscillation and Waves**	
	The aim of this unit is to familiarize the students with basic features of different oscillatory systems waves in general. The topics included in this unit should be treated qualitatively.	
(a)	Oscillatory systems: Simple harmonic oscillation, damped harmonic oscillation, forced vibration, resonance, coupled oscillation.	3 hrs
(b)	Waves as periodic variation quantity in space and time, wave equation, Reflection and transmission of waves at boundary of two media.	3 hrs

Unit - 2	**Interference**	
	The principle of superposition of waves is extended to the interference of light of waves. Some systems for production of observable interference patterns are covered.	
(a)	Superposition of waves: Two beam superposition, Multiple-beam superposition, coherent and incoherent superposition.	2 hrs
(b)	Two source interference pattern, Intensity distribution, Biprism, Determination of wavelength of light. Newton's rings: Determination of wavelength of light, refractive index of liquid.	2hrs

Unit - 3	**Diffraction**	
	Diffraction of light waves at some simple obstacles are to be covered in this unit. Both Fresnel and Fraunhofer pattern are included.	
(a)	Huygen's principle, Fresnel and Fraunhofer diffraction, zone plate.	2 hrs
(b)	Fraunhofer diffraction due to a single slit, Plane transmission grating- diffraction spectra, determination of wave length of light.	3hrs

Module : II   (11 hour)

Unit- 4	**Polarization**	
	The unit covers elementary features of polarization of light waves.	
(a)	Polarization of transverse waves, plane, circular and elliptically polarized light. Polarization by reflection, refraction and scattering.	2 hrs
(b)	Double refraction; Nicol prism, Quarter – wave plate, half – wave plate- construction and use.	2 hrs
(c)	Production and analysis of circular and elliptically polarized light, Optical rotation (Only concepts)	1 hrs

Unit – 5 Electromagnetism- Student will be familiarized with some basic used in vector calculus prior to development of Maxwell's electromagnetic wave equations. No proof of theorems and laws included in this unit expected- statement and interpretation should sufficient.

(a)	Vector calculus: gradient of scalar field, divergence, curl of vector field (Only Physical significance) Gauss divergence theorem, Stoke's theorem, Green's theorem (Only Statements)	2 hrs
(b)	Gauss's law of electrostatics in free space and in a medium(Only statements) electric displacement(**D**)magnetic Induction (**B**),Amperes circuital law (Only statements), displacement current, Faraday's law of electromagnetic induction(Only statements).	2 hrs
(c)	Maxwell's electromagnetic equation in differential form and in integral form(Only statements). Electromagnetic energy density, poynting vector, poynting theorem, vector potential and scalar potential, electromagnetic wave equation for E and B, transverse nature of EM waves. 4-2	2 hrs

Module III   (10 hours)

Unit - 6 Quantum Physics : This unit deals with elementary concepts of quantum physics formulation to deal with physical systems.

(a)	Need for Quantum physics-Historical overviews, Particle aspects of radiation- Black body radiation, photoelectric effect, Compton scattering, pair production.(No derivations), Wave aspect of particles- matter wave, de Broglie Hypothesis, Heisenberg Uncertainty principles- Statement, Interpretation and example.	3 hrs
(b)	Basic features of Quantum mechanics- Transition from deterministic to probabilistic, States of system- Wave function, probability density, superposition principle, observables and operators, expectation values. Schrodinger equation- Time dependent and time independent, wave packets.	4 hrs

Unit – 7 Application of Quantum Mechanics- This unit deals with applications of quantum Mechanics to specific one-dimensional problems (Sketch, Schrodinger equation for different regions, Boundary conditions, final expressions and physical interpretations only, no derivations).

Free particles- continuous states, Potential steps- Reflections, transmissions, Potential Barrier-Tunneling, Infinite deep potential well-energy eigen values, eigen functions.   3 hrs

Text Books :
1. Engineering Physics by D.R. Joshi, Mc Graw Hill
2. Engineering Physics by H.K. Malik and A.K. Singh, Mc Graw Hill.

Reference Book:
1. Quantum Mechanics by Powel & Craseman.
2. Optics- A. K. Ghatak
3. Electricity & Magnetism : E.M. Purecell
4. Introduction to Electrodynamics- David J. Griffiths, PHI Publication
5. Concepts of Modern Physics – Arthur Beiser.
6. Engineering Physics- K.P.Mishra and P. Pattojoshi, Scitech Pub.
7. Concepts in Engineering Physics-I Md. N. khan, Alok Publication.
8. Physics-I for engineering degree students-B.B. Swain and P.K.Jena.
9. An Introduction to Machanics by D.Klippner & R. Kolenkow, TMH

BE7103 PHYSICS LABORATORY (0-0-3)

A Student is expected to perform **ten** experiments from the list given below.

1. Determination of Young's modulus by Searle's methods.
2. Determination of Rigidity modulus by static methods.
3. Determination of surface tension by capillary rise method.
4. Determination of acceleration due to gravity by Bar / Kater's pendulum.
5. Determination of thermal conductivity by Lee's method.
6. Determination of wave length of light of light by Newton's ring apparatus.
7. Determination of grating element of a diffraction grating.
8. Determination of wave length of light of light by Biprism.
9. Plotting of characteristic curves of a PN junction diode.
10. Plotting of characteristic curves of BJT.
11. Verification of laws of verification of strings using sonometer.
12. Determination of wavelength of laser source by diffraction rating methods.
13. Study of Hall effect.
14. Study of RC circuit.
15. Study of a power source- output imedence.

Book: Engineering Practical Physics by S.Panigrahi & B.Mallick –S.Pub. 5

BE2104 **Mechanics** (3-0-0)

Module I (13 Hours)

Concurrent forces on a plane – Composition and resolution of forces and equilibrium of concurrent coplanar forces, Method of projections, Methods of moment, Friction.

Parallel forces in a plane- Two parallel forces, General case of parallel forces, Center of parallel forces in a plane and center of gravity- centroids of composite plane figure and curves, Distributed parallel forces in a plane. General case of forces in a plane- composition of forces in a plane and equilibrium of forces in a plane.

Module II (13 Hours)

Plane trusses- method of joints and method of sections, Principle of virtual work – equilibrium of ideal systems.
Moments of Inertia- Plane figure with respect to an axis in its plane and perpendicular to the plane- parallel axis theorem, Moment of Inertia of material bodies.
Rectilinear Translation- Kinematics- Principles of Dynamics- D'Alemberts Principles.

Module III (14 Hours)

Momentum and impulse, Work and Energy- impact

Curvilinear translation- Kinematics- equation of motion- projectile- D'Alemberts Principle in curvilinear motion, Moment of momentum, Work- Energy in curvilinear motion.
Kinetics of Rotation of rigid body

Text Books:

1. Engineering Mechanics by S Timoshenko, D.H Young and J.V.Rao, Revised 4th edition (Special Indian Edition), McGraw Hill.

Reference Books:

1. Fundamental of Engineering Mechanics(2nd Edition) by S. Rajesekharan & G.Sankara Subramanium, Vikash Publishing House Pvt. Ltd.
2. Engineering Mechanics by Shames and Rao, Pearson Education.
3. Engineering Mechanics, Statics and Dynamics by Boresi and Schmidt, Thomson.
4. Engineering Mechanics by I.S.Gunjal, Laxmi publications.
5. Engineering Mechanics by K.L.Kumar, Tata McGraw Hill
6. Engineering Mechanics by Kumaravelan, Scitech

Module – I (9Hours)

1. Basic concepts and definition: Scope of Thermodynamics, Macroscopic and Microscopic approaches; Definition of Fixed mass (closed systems) and Control volume(open system), Properties (extensive and Intensive), State and its representation on a property diagram, Process and its representation, Cyclic process (or cycle) and its representation, Characteristics of properties (point and path function);Reversible and Irreversible processes; Thermal, mechanical and Chemical equilibrium, Thermodynamic equilibrium, Zeroth
Law of Thermodynamics and temperature, Measurement of temperature and calibration of thermometers, the ideal gas temperature scale, Measurement of pressure, Bourdon pressure gage and manometers, gage and absolute pressure.

2. Ideal gages and their P-V-T relations, Gas mixtures

3. Energy Transfer: Work Transfer (definition and calculation), Different modes of work, Displacement Work for various process, Heat Transfer; Modes of heat transfer, Basic laws in conduction, convection and radiation, combined modes of heat transfer with examples.

Module-II(13 hours)

4.   First Law of Thermodynamics:
   i   Formal statement (using cyclic processes), First law for processes of fixed masses(closed systems) and introduction of internal energy as a thermodynamics property, Introduction of enthalpy as a thermodynamic property; Definition of specific heats and their use in calculation of internal energy and enthalpy with emphasis on ideal gages.
   ii   Application of First Law to control volumes; Nozzle, Diffuser, Compressor, Turbine, Throttling device, Heat Exchanger.(only steady flow need be considered)

5.   Second Law of Thermodynamics: Kelvin- Planck and Clausius statements of Second Law, Reversible and irreversible engines and their efficiency, Entropy concepts and the principle of entropy increase.
6.
   Module-III(13 hours)

7.   Properties of pure substances:
         p-v, p-T, T-S, h-S diagram for steam, different types of steam, Introduction to steam tables with respect to specific volume, pressure, temperature, enthalpy and entropy

8.   Application of thermodynamics:
         Air compressors, steam power plant, Refrigerators and Heat pump, I.C. Engines (Brief Description of different components of above mentioned systems and working principles with Schematic diagram only)

   Text Books:

   1.   Engineering Thermodynamics by P.K.Nag, Publisher: TMH
   2.   Basic Engineering Thermodynamics by Rayner Joel, Pearson Education

Reference Books:

1. Engineering Thermodynamics by Van Wylen and Sontang, John Wiley
2. Engineering Thermodynamics by M.Achuthan, Publisher: PHI
3. Applied Thermodynamics by Eastop and McConkey, Publisher: Pearson
4. Fundamental of Engineering Thermodynamics by E. Rathakrishnan, publisher. PHI
5. Engineering Thermodynamics by Russel and Adebiyi, publisher, Oxford
6. Steam Tables in SI Units by Ramalingam, Scitech.

BE7101 <u>Engineering Drawing</u>   (0-0-3)

Sheet Lay-out & Sketching, Line Drawing, Lettering & Dimensioning; Concept of Orthographic Projection, First-angle Projection, Projections of Points, Projection of straight line, Projection of planes, Projection of Solids, Intersection of surfaces, Development of surfaces, Isometric Projection, Sectional Views of solids, Full section, Introduction to computer-Aided Drafting.

Text Books:

1. Engineering Drawing by N.D.Bhatt & V.M.Panchal, Charotar publishing House, Anand
2. Engineering Drawing with an Introduction to AutoCAD by Dhanjay A. Johle, Tata McGraw Hill

Reference Books:

1. Machine Drawing by Junarkar, Pearson Education.
2. Machine Drawing (Includes AutoCAD) by Ajeet Singh, Tata McGraw Hill.
3. Machine Drawing with AutoCAD by Pohit and Ghosh, Pearson Education.
4. Text Book on Engineering Drawing by Narayana / Kannaiah, Scitech.
5. Engineering Drawing by Shah and Rana, Pearson Education
6. Engineering Drawing and Graphics using AutoCAD by T.Jeyapoovan, Vikas Publishing
7. Engineering Drawing and Graphics by K.Venugopal, New Age International.

BE7102 <u>Workshop Practice</u>   (0-0-3)

Fitting Practice: Use of hand tools in fitting, preparing a male and female joint of M.S. or making a paper weight of M.S.

Welding Practice : Gas welding & Electric Arc welding Practice.
A joint such as a Lap joint, a T-joint or a Butt joint is to be prepared or to make furniture.

Machining:

(i)   Stepped cylindrical Turning of a job and Thread-cutting in lathe.
(ii)   Shaping
(iii) Milling

Reference:

1. Elements of Workshop Technology, Vol. I and II by Hajra choudhary, Khanna Publishers
2. Workshop Technology by WAJ Chapman, Viva Books
3. Workshop Manual by Kannaiah/ Narayana, Scitech

BE2101 - <u>Basic Electronics</u>
(3 – 0 – 0; Credits: 3; Contact Hours: 3)
<u>Theory</u>

MODULE – I (11 hours)

1. Introduction to Electronics: Signals, Frequency spectrum of signals, Analog and digital signals, Amplifiers, Digital logic inverters. (1.1 to 1.4 and 1.7 of Sedra and Smith)   (1 Lectures)

2. The Operational Amplifier (Op-Amp): The ideal Op-Amp, Inverting and non-inverting configurations, Difference amplifier, CMRR, Application of Op-Amp (Instrumentation amplifier, Summing amplifier, Integrator and Differentiator). (2.1 to 2.4 and 2.8 of Sedra and Smith)   (3 Lectures)

3. Semiconductor Diodes: Introduction, Physical operation of p-n junction diodes, Characteristics of p-n junction diodes, Zener diode, Rectifier circuits (half-wave, full-wave, bridge and peak rectifiers), Diode clipper and clamper circuits, Light emitting diodes. (3.7, 3.2, 3.4 to 3.6 and 3.8 of Sedra and Smith)   (4 Lectures)

4. Bipolar Junction Transistors (BJTs): Simplified structure and physical operation of n-p-n and p-n-p transistors in the active region, Current-voltage characteristics of BJT, BJT as an amplifier and as a switch. (5.1 to 5.3 of Sedra and Smith)   (3 Lectures)

MODULE – II (11 hours)

5. Bipolar Junction Transistors (BJTs): BJT Circuits at DC, Biasing in BJT amplifier circuits, Small Signal Operation of BJT: Simplified hybrid-π model and its application to single stage BJT amplifiers (Common-Emitter, Common-Base and Common-Collector configurations). (5.4 to 5.7 of Sedra and Smith) (4 Lectures)

6. Feedback Amplifiers and Oscillators: General feedback structure, Properties and advantages of negative feedback, Basic principles of sinusoidal oscillators, The Barkhausen criterion, Op-Amp Oscillator circuits (Wien-Bridge oscillator, RC phase-shift oscillator and Crystal oscillator). (8.1, 8.2 and 13.1 to 13.3 of Sedra and Smith)   (4 Lectures)

7. Electronic Instruments: Basic principle of Oscilloscope, Function of the sweep generator, Block diagrams of oscilloscope, Simple CRO, Measurement of frequency and phase by Lissajous method, Application of oscilloscope for measurement of voltage, period and frequency, Block diagram of standard signal generator, AF sine and square wave generator, and Function generator.(7.2 to 7.5, 7.20,7.26, 7.30, 8.5, 8.7 and 8.8 of Kalsi)   (3 Lectures)

MODULE – III (10 hours)

Digital Electronic Principles: Introduction, Binary digits, Logic levels and Digital waveforms, Introduction to basic logic operation, Number system, Decimal numbers, Binary numbers, Decimal-to-Binary conversion, Simple binary arithmetic. (1.2, 1.3 and 2.2 to 2.4 of Floyd and Jain)   (2 Lectures)

8. Logic Gates and Boolean Algebra: The inverter, The AND, OR, NAND NOR, Exclusive-OR and Exclusive-NOR gate, Boolean operations and expressions, Laws and Rules of Boolean algebra, DeMorgan's theorem, Boolean analysis of logic circuits, Standard forms of Boolean expressions, Boolean expression and truth table. (3.1 to 3.6 , 4.1 to 4.7 of Floyd and Jain)   (4 Lectures)

9. Combinational Logic and Their Functions: Basic combinational logic circuits, Implementation of combinational logic, The universal properties of NAND and NOR gates, Basic adders, Multiplexers and Demultiplexers., Elementary treatment of Latches, Basic concepts of Memory (RAMs) (5.1 to 5.4, 6.2, 6.4, 6.8, 6.9, 7.1 and 10.2 of Floyd and Jain)   (4 Lectures)

Text Books:

1. Microelectronic Circuits (Fifth Edition), Adel S. Sedra and Kenneth C. Smith, Oxford University Press, YMCA Library Building Jai Singh Road, New Delhi – 110 001.
2. Digital Fundamentals (Eighth Edition), Thomas L. Floyd and R.P. Jain, Pearson Education, 482 FIE, Patparganj, Delhi – 110 092.
3. Electronic Instrumentation, H.S. Kalsi, Tata McGraw-Hill Publishing Company Limited, New Delhi.

Reference Books:

4. Electronic Devices (Seventh Edition), Thomas L. Floyd, Pearson Education, 482 FIE, Patparganj, Delhi – 110 092 (Selected Portions).
5. Electronic Devices and Circuit Theory (Ninth Edition), Robert L. Boylestad and Louis Nashelsky, Pearson Education, 482 FIE, Patparganj, Delhi – 110 092.
6. Electronics Principles (7th Edition), Albert Malvono and David J. Bates, Tata McGraw-Hill Publishing Company Limited, New Delhi.

BE7105 - <u>Basic Electronics Laboratory</u>
(0 – 0 – 3; Credits: 2; Contact Hours: 3)

(At least 8 experiments including experiments 1 to 7 and any one from experiments 8 to 10)

1. Familiarization of electronic components and devices (Testing of semiconductor diodes and transistors using digital multimeter)

2. Study and use of Oscilloscope, signal generator to view waveforms and measure amplitude and frequency of a given waveform.

3. V-I characteristics of semiconductor diode and determining its DC and AC resistance.

4. Studies on half-wave and full-wave rectifier circuits without and with capacitor filter; recording of the waveforms and measurement of average and rms values of the rectifier output.

5. V-I characteristic of an n-p-n or p-n-p transistor, DC biasing the transistor in common-emitter configuration and determination of its operating point (i.e., various voltages and currents).

6. Studies on Op-Amp applications (Inverting, non-inverting integrating and differentiating configurations); recording of the input-output waveforms.

7. Studies on Logic gates (Truth table verification of various gates).

8. Gain-frequency response studies of a BJT common-emitter RC coupled amplifier.

9. Studies and experiments using MUX-DEMUX ICs.

10. Study on CMOS logic inverter.

BS1101 - __MATHEMATICS-I__ (3-1-0)
(1st Sem)

Module -1   (15 Hours)

Differential Equation: First order differential equations, Separable equation, exact differential equation, Linear differential equation, Bernoulli's equation and application to Electrical circuits. Linear differential equation of second and higher order, Homogeneous equation with constant co-efficient, Euler-Cauchy equations, Solution by undetermined co-effficient, Solutions by variation of parameters, Modeling of electric circuits

Module-II   (15Hours)

Calculus: Asymptote, Curvature
Series solution of differential equations, Power series method, Legendres equation and Lagenders polynomials, Bessels equation , Bessels function and its application

Module-III   (15 Hours)

Linear algebra, Matrices, Vectors, Determinants, System of linear equations, eigen values and eigen vectors, Symmetric and skew-symmetric matrices, Orthogonal matrices, Complex matrices, Hermitian and skew-hermitian matrices, Unitary matrices and similarity of matrices.

Text Books :

1. Differential Calculus by Santi Narayan and Mittal, Chapters 14, 15

    Publisher: S. Chand

2. Advanced Engineering Mathematics by E. Kreyszig

Chapter 1(1.1 to 1.6),
Chapter 2(2.1 to 2.12)
Chapter 4(4.1 to 4.3, 4.5, 4.6
Chapter 6(6.1 to 6.6)
Chapter 7(7.1 to 7.5)

Reference Books:

1. Higher Engineering Mathematics by B. V. Ramana

    Publisher: TMH

2. Mathematical Methods by Potter Goldberg

    Publisher: PHI

BS1104 **MATHEMATICS-II** (3-1-0)
(2nd Sem)

Module – I   (15 Hours)
Laplace transformation and its use in getting solution to differential equations, Convolution , Integral equations
Fourier series, Fourier expansion of functions of any period, Even and odd functions, Half range expansion

Module – II   (15 Hours)
Fourier transform and Fourier Integral, Gamma, Beta functions, error function
Vector differential calculus: vector and scalar functions and fields, Derivatives, Curves, tangents and arc length, gradient, divergence, curl

Module – III   (15 Hours)
Vector integral calculus: Line Integrals, Green Theorem, Surface integrals, Gauss theorem and Stokes theorem

Text Book
1. Advanced Engineering Mathematics by E. Kreyszig
                        Publisher: John Willey & Sons Inc- 8th Edition
   Chapter 5(5.1 to 5.7),
   Chapter 8(8.4, 8.5, 8.9 to 8.11)
   Chapter 9(9.1 to 9.9)
   Chapter 10(10.1 to 10.4, 10.8 to 10.10)

Reference Books:

3. Higher Engineering Mathematics by B. V. Ramana
                        Publisher: TMH
4. Mathematical Methods by Potter and Goldberg
                        Publisher: PHI

HM 3101 <u>English Communication Skills</u> (2-0-0)
(Theory)

Module-I   The elements of communication   (6 hours)

  1.1   the importance of communication through English at the present time
  1.2   the process of communication and factors that influence communication :
           sender, receiver, channel, code, topic, message, context, feedback, 'noise',
           filters and barriers
  1.3   the importance of audience and purpose
  1.4   the information gap principle : given and new information ; information overload
  1.5   verbal and non-verbal communication : body language
  1.6   comparing general communication and business communication

Module-II   The sounds of English   (14 hours)

  2.1   vowels, diphthongs, consonants, consonant clusters
  2.2   the International Phonetic Alphabet (IPA) ; phonemic transcription
  2.3   problem sounds
  2.4   syllable division and word stress
  2.5   sentence rhythm and weak forms
  2.6   contrastive stress in sentences to highlight different words
  2.7   intonation : falling, rising and falling-rising tunes
  2.8   varieties of Spoken English : Standard Indian, American and British

(**Note :**   This unit should be taught in a simple, non-technical manner, avoiding technical terms as far as possible.)

Module-III   Review of English grammar   (10 hours)

  3.1   stative and dynamic verbs
  3.2   the auxiliary system ; finite and non-finite verbs
  3.3   time, tense and aspect
  3.4   voice: active and passive
  3.5   modality
  3.7   negation
  3.8   Interrogation ; reported and tag questions
  3.9   conditionals
  3.10   concord
  3.11   Phrasal verbs

(**Note** The teaching of grammar should be treated as a diagnostic and remedial activity and integrated with communication practice. The areas of grammar in which errors are common should receive special attention when selecting items for review. Teaching need not be confined to the topics listed above.))

Books recommended:
1. An Introduction to Professional English and Soft Skills by B.K.Das et al., Cambridge University Press. (Facilitated by BPUT).

HM 7101 <u>Communicative Practice Lab -I</u>   (0-0-3)
(1ST Sem)

Lab sessions will be devoted to practice activities based on all three modules of theory.

a. phonemic transcription   5 hours

Students will be trained to find out the correct pronunciation of words with the help of a dictionary, to enable them to monitor and correct their own pronunciation.
i   transcription of words and short sentences in normal English orthography (writing)
    into their IPA equivalents ;
ii transcription of words presented orally ;
iii conversion of words presented through IPA symbols into normal orthography
iv syllable division and stress marking (in words presented in IPA form)

b. Listening   10 hours

i   listening with a focus on pronunciation (ear-training) : segmental sounds, stress,
    weak forms, intonation

Students should be exposed, if possible, to the following varieties of English during listening practice : Standard Indian, British and American.

c. Speaking   15 hours

i   pronunciation practice (for accent neutralization), particularly of problem sounds, in
    isolated words as well as sentences
ii practising word stress, rhythm in sentences, weak forms, intonation
ii reading aloud of dialogues, poems, excerpts from plays, speeches etc. for practice
    in pronunciation

d. Grammar and usage   12 hours

 The focus will be on the elimination of common errors. Some writing activities (e.g. writing of short paragraphs on assigned topics) can be used to identify these errors.

Project Work

Students will be required to produce and submit by the end of Semester 1 a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of the 100 marks allocated for the Lab test) will be set apart for the project.

Business Communication (2-0-0)

(2nd Sem.)

Module - I   The Elements of Business Communication   (10 hours)

1.1   patterns of communication in the business world: upward, downward, horizontal, grapevine etc

1.2   internal and external channels of communication; formal and informal channels.

1.3   Introduction to cross-cultural communication.

1.4   avoiding gender, racial and other forms of bias in communication

1.5   common forms of oral and written communication in the business world:
Oral presentations, interviews and group discussions
Memos, reports, summaries and abstracts, e-mails

Module-II   Reading and writing   (15 hours)

2.1   the importance of developing reading skills

2.2   the sub-skills of reading :
a.   understanding the main idea and supporting details
b.   reading between the lines : inferential reading
c.   understanding the writer's point of view
d.   making predictions
e.   guessing the meanings of unfamiliar words
f.   skimming and scanning
g.   note-making

2.3   the importance of writing skills

2.4   the differences between speech and writing

2.5   the qualities of effective writing : coherence, cohesion, logical structuring and organization, clarity of language, stylistic variation etc.

2.6   the writing process : pre-writing, drafting, re-writing

2.7

Module -III   Soft skill development   (5 hours)

4.1   soft skills: becoming a good leader and team-player

4.2   inter-relating soft skills and communication skills

Books recommended:

1   Business Communication Today by Bovee et al (Pearson)
2   Business Communication by Meenakshi Raman and Prakash Singh (Oxford)
3   Crash Course in Personal Development by Brian Clegg (Kogan Page)
4   Activities for Developing Emotional Intelligence by Adele B.Lynn (HRD Press)
5   Lateral Thinking by Edward De Bono (Penguin)

HM 7102 <u>Communicative Practice Lab -II</u> (0-0-3)
(2nd Sem)

a.	**Communication Practice**	**30 hours**
i	Speaking : oral communication in social and work-related situations, e.g.:	10 hours

Greeting an acquaintance/ friend, introducing oneself, introducing a friend to
another friend, breaking off a conversation politely, leave-taking;
making and responding to inquiries; expressing an opinion;
expressing agreement/ disagreement, contradicting/ refuting an argument;
expressing pleasure, sorrow, regret, anger, surprise, wonder, admiration,
disappointment etc.
Narrating or reporting an event;
Describing people, objects, places, processes etc.
Ordering / directing someone to do something
Making requests; accepting / refusing a request
Expressing gratitude; responding to expressions of gratitude
Asking for or offering help; responding to a request for help
Asking for directions (e.g. how to reach a place, how to operate a device etc.) and
giving directions
asking for and granting/ refusing permission
prohibiting someone from doing something
suggesting, advising, persuading, dissuading, making a proposal
praising, complimenting, felicitating
expressing sympathy (e.g. condolence etc.)
Complaining, criticizing, reprimanding

ii	**Reading**	**10 hours**

Students will be given practice in reading and comprehending 6-8 simple passages of 100-300 words each, on topics of general as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment, together with study skills (note making) and reference skills (using a dictionary).

Practice will be provided in the important sub-skills of reading which are introduced in Module 2 of the theory component.

iii	**Writing**	**10 hours**

Writing short paragraphs on given topics or topics of one's choice; social and business letters; reports; applications ; resumes ; summaries

The principles of 'Process Writing' should be used to teach writing skills.
- i   pre-writing : generating ideas, brain-storming, idea mapping, outlining
- ii   writing : generating a first draft ; reviewing, redrafting, editing
- iii   post-writing : making a presentation ; discussion and feedback, preparing the final draft

b.	**Soft skills practice**	**10 hours**

Activities designed to highlight leadership and 'team' skills ; Group discussion

BE2102 - **Basic Electrical Engineering** (3-0-0)

Module I (10 Hours)
Fundamentals of Electric Circuits
Charge, current, KCL, Voltage and KVL, Electric Power and sign conventions, circuit elements and their characteristics, Resistance and Ohm's Law
Practical voltage and current sources, Measuring devices
(Rizzoni: Ch 2.2 to 2.8)
Resistive Network Analysis
Node voltage analysis, Mesh current analysis, node and mesh current analysis with controlled sources, principle of superposition, maximum power transfer
(Rizzoni: Ch3.1 to 3.5 and 3.7)

Module II (15 Hours)
AC Network analysis
Energy Storage elements, time-dependent signal sources, solution of circuits containing energy storage elements, phasor solutions of circuits with sinusoidal excitations, AC circuit analysis methods
(Rizzoni: Ch 4.1 to 4.5)
Transient Analysis
Transient Analysis, Writing differential equations for circuits, DC steady state solutions of circuits, Transient Response of second order circuits
(Rizzoni: Ch 5.1 to 5.5)
AC Power
Power in AC circuits, Complex Power, Transformers, Three-phase power, Residential Wiring: Grounding and safety
Generation and distribution of AC Power
(Rizzoni: Ch 7.1 to 7.6)

Electronic Instrumentation and Measurements
Measurement Systems and Transducers, Wiring, Grounding and noise, signal conditioning, A/D and D/A Conversion
(Rizzoni: Ch 15.1 to 15.4)

Module III   (15 Hours)
Principles of Electro mechanics
Electricity and Magnetism, Magnetic Circuits, Magnetic Materials and B-H curves, Transformers, Electromechanical Energy Conversion
(Rizzoni: Ch 18.1 to 18.5)
Introduction to Electric Machines
Rotating Electric machines, DC Machines, DC Generators, DC Motors, AC machines, Alternator
(Rizzoni: Ch 19.1 to 19.6)

Text Book
Principles and Applications of Electrical Engg., Rizzoni, McGrawHill
Reference Books
1. Electrical & Electronic Technology, E. Huges, Pearson, 9th Edition
2. Basic Electrical Engineering, A. Fitzerlad, D. E.Higginbotham and A.Grabel, TMH, 5th Ed.
3. Electrical Engineering Fundamentals, Vincent Del Toro, 2nd Edition, PHI

BE 7106 - <u>BASIC ELECTRICAL ENGINEERING LABORATORY</u> (3-1-0)

Select any 8 experiments from the list of 10 experiments :

1. Connection and measurement of power consumption of a fluorescent lamp.
2. Measurement of armature and field resistances of a DC compound machine.
3. Starting and speed control of a DC shunt motor by (a) field flux control method, and (b) armature voltage control method.
4. V-I characteristics of incandescent lamps and time-fusing current characteristics of a fuse.
5. Connection and testing of a single-phase energy meter.
6. Starting of three-phase induction motor by star-delta starter.
7. Determination of open circuit characteristics (OCC) of DC shunt generator.
8. Calculation of current, voltage and power in series R-L-C circuit excited by single-phase AC supply and calculation of power factor.
9. Calculation of no load losses of a single-phase transformer.
10. Study of single-phase induction motors/ fan motors.

BE 2105 <u>PROGRAMMING IN 'C'</u> (3-0-0)

Module – I   [12 Hours]

Algorithm, flowchart, Structured Programming Approach, structure of C program (header files, C pre-processor, standard library functions, etc.),identifiers, basic data types and sizes, Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation. Input-output statements, statements and blocks, if and switch statements, loops:-while, do-while and for statements, break, continue, goto, programming examples.

Module – II   [12 Hours]

Designing structured programs: - Functions, parameter passing, storage classes- extern, auto, register, static, scope rules, user defined functions, recursive functions. Arrays- concepts, declaration, definition, accessing elements, and functions, two-dimensional and multi-dimensional arrays, applications of arrays. pointers- concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory management functions, command line arguments,

Module – III   [12 Hours]
Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit fields, C program examples. Input and output – concept of a file, text files and binary files, streams, standard I/O, Formatted I/O, file I/O operations, error handling, C program examples.

Text Books:

1. Balagurusamy : "C Programming" Tata McGraw-Hill
2. P. Dey & M. Ghosh, "Computer Fundamental & Programming in C"- Oxford University Press
3. Deitel -"C How to programme" PHI publication/ Pearson Publication

Reference Books:

1. Y. Kanitkar – "Let us C" BPB Publisher
2. H. Schildt – "C the complete Reference" McGraw-Hill
3. Schaum Series- "C Programming" - Gotterfried

BE7107 – 'C' PROGRAMMING LAB (0-0-3)

(Minimum 10 programs to be done covering 8 Experiments)

Experiment No. 1

a) Write a C program to find the sum of individual digits of a positive integer.
b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Experiment No. 2

a) Write a C program to calculate the following Sum:
　　$Sum = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$
b) Write a C program to find the roots of a quadratic equation.

Experiment No. 3

a) Write C programs that use both recursive and non-recursive functions
　　i) To find the factorial of a given integer.
　　ii) To find the GCD (greatest common divisor) of two given integers.
　　iii) To solve Towers of Hanoi problem.
Experiment No. 4

a) Write a C program to find both the larges and smallest number in a list of   integers.
b) Write a C program that uses functions to perform the following:
　　i) Addition of Two Matrices
　　ii) Multiplication of Two Matrices

Experiment No. 5

a) Write a C program that uses functions to perform the following operations:
　　i)   To insert a sub-string in to given main string from a given position.
　　ii) To delete n Characters from a given position in a given string.
b) Write a C program to determine if the given string is a palindrome or not

Experiment No. 6

a) Write a C program to construct a pyramid of numbers.
b) Write a C program to count the lines, words and characters in a given text.

Experiment No.7

a) Write a C program that uses functions to perform the following operations:
　　i) Reading a complex number
　　ii) Writing a complex number
　　iii) Addition of two complex numbers
　　iv) Multiplication of two complex numbers
(Note: represent complex number using a structure.)

Experiment No. 8

a) Write a C program which copies one file to another.
b) Write a C program to reverse the first n characters in a file.
(Note: The file name and n are specified on the command line.)

Book:- PVN. Varalakshmi, Project Using C Scitech Publisher

BE 2106 <u>DATA STRUCTURE</u> (3-0-0)

Module – I

[12 hours]

Introduction to data structures: storage structure for arrays, sparse matrices, Stacks and Queues: representation and application. Linked lists: Single linked lists, linked list representation of stacks and Queues. Operations on polynomials, Double linked list, circular list.

Module – II

[12 Hours]

Dynamic storage management-garbage collection and compaction, infix to post fix conversion, postfix expression evaluation. Trees: Tree terminology, Binary tree, Binary search tree, General tree, B+ tree, AVL Tree, Complete Binary Tree representation, Tree traversals, operation on Binary tree-expression Manipulation.

Module –III

[12 Hours]

Graphs: Graph terminology, Representation of graphs, path matrix, BFS (breadth first search), DFS (depth first search), topological sorting, Warshall's algorithm (shortest path algorithm.) Sorting and Searching techniques – Bubble sort, selection sort, Insertion sort, Quick sort, merge sort, Heap sort, Radix sort. Linear and binary search methods, Hashing techniques and hash functions.

Text Books:

1. Gilberg and Forouzan: "Data Structure- A Pseudo code approach with C" by Thomson publication

2. "Data structure in C" by Tanenbaum, PHI publication / Pearson publication.

3. Pai: "Data Structures & Algorithms; Concepts, Techniques & Algorithms "Tata McGraw Hill.

Reference Books:

1. "Fundamentals of data structure in C" Horowitz, Sahani & Freed, Computer Science Press.

2. "Fundamental of Data Structure" (Schaums Series) Tata-McGraw-Hill.

(Minimum 10 experiments to be done)

Experiment No.1

Write a C program to perform matrix multiplication using array.

Experiment No.2

(a) Write a C program to create a stack using an array and perform
         (i) push operation (ii) pop operation
(b) Write a C program to create a queue and perform
         i) Push   ii) pop iii) Traversal

Experiment No. 3

Write a C program that uses Stack operations to perform the following:
       i) Converting infix expression into postfix expression
       ii) Evaluating the postfix expression

Experiment No. 4
Write a C program that uses functions to perform the following operations on Single linked list:
       i) Creation ii) Insertion   iii) Deletion   iv) Traversal in both ways

Experiment No. 5

Write a C program that uses functions to perform the following operations on Double linked list:
       i) Creation ii) Insertion   iii) Deletion

Experiment No. 6

Write a C program that uses functions to perform the following operations on Binary Tree:
       i) Creation ii) Insertion   iii) Deletion

Experiment No. 7

Write C programs that use both recursive and non recursive functions to perform the Linear search operation for a Key value in a given list of integers:
       i) Linear search

Experiment No. 8

Write C program that use both recursive and non recursive functions to perform the Binary search operation for a Key value in a given list of integers:

Experiment No.9

Write a C program that implement Bubble Sort method to sort a given list of integers in descending order.

Experiment No.10

Write a C program that implement Quick Sort method to sort a given list of integers in ascending order:

Book:- "Data structure using C" by Sudipta Mukherjee, TMH Publication

BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ODISHA

Production Engineering

3rd SEMESTER			4th SEMESTER		
THEORY	Contact Hours		THEORY	Contact Hours	
Code Subject	L-T-P	Credits	Code Subject	L-T-P	Credits
BSCM1205 Mathematics – III	3-1-0	4	BSCM1210 Mathematics – IV	3-1-0	4
HSSM3204 Engineering Economics & Costing	3-0-0	3	HSSM3205 Organizational Behavior	3-0-0	3
PCPR4201 Manufacturing Processes- I	3-0-0	3	PCPR4203 **Manufacturing Processes- II**	3-0-0	3
PCPR4202 MEASUREMENT AND METROLOGY	3-0-0	3	PEPL5307 Strength of Materials	3-1-0	4
PCME4203 Introduction to Physical Metallurgy & Engineering Materials	3-1-0	4	PCPR 4204 Hydraulics & Hydraulic Machines	3-0-0	3
PCMF4203 Theory of Machines	3-0-0	3	PCMF4205 Work Study & Ergonomics	3-0-0	3
Credits (Theory)		20	Credits (Theory)		20
PRACTICALS/SESSIONALS			PRACTICALS/SESSIONALS		
PCPR7201 Measurement & Metrology Lab.	0-0-3	2	PCPR7204 Manufacturing Process Lab – II.	0-0-3	2
PCPR7202 Manufacturing Process Lab – I.	0-0-3	2	PCPR 7205 Material Testing Lab	0-0-3	2
PCPR7203 Computer Aided Drawing Lab.	0-0-3	2	PCPR 7206 Fluid Mechanics & Hydraulic Machines Lab	0-0-3	2
Credits (Practical / Sessionals)		6	Credits (Practical/Sessionals)		6
TOTAL SEMESTER CREDITS		26	TOTAL SEMESTER CREDITS		26
TOTAL CUMULATIVE CREDITS			TOTAL CUMULATIVE CREDITS		

BSCM1205 MATHEMATICS - III

Module-I   **(18 hours)**

Partial differential equation of first order, Linear partial differential equation, Non-linear partial differential equation, Homogenous and non-homogeneous partial differential equation with constant co-efficient, Cauchy type, Monge's method, Second order partial differential equation

The vibrating string, the wave equation and its solution, the heat equation and its solution, Two dimensional wave equation and its solution, Laplace equation in polar, cylindrical and spherical coordinates, potential.

Module-II   **(12 hours)**

Complex Analysis:

Analytic function, Cauchy-Riemann equations, Laplace equation, Conformal mapping,

Complex integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions

Module –III   **(10 hours)**

Power Series, Taylor's series, Laurent's series, Singularities and zeros, Residue integration method, evaluation of real integrals.

Text books:

1. E. Kreyszig," Advanced Engineering Mathematics:, Eighth Edition, Wiley India
   Reading Chapters: 11,12(except 12.10),13,14,15

2. B.V. Ramana, " Higher Engineering Mathematics", McGraw Hill Education,
   2008 Reading chapter: 18

Reference books:

1. E.B. Saff, A.D.Snider, " Fundamental of Complex Analysis", Third Edition,
   Pearson Education, New Delhi

2. P. V. O'Neil, "Advanced Engineering Mathematics", CENGAGE Learning, New Delhi

HSSM3204 ENGINEERING ECONOMICS & COSTING

Module-I: **(12 hours)**

Engineering Economics – Nature and scope, General concepts on micro & macro economics. The Theory of demand, Demand function, Law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply. Determination of equilibrium price under perfect competition (Simple numerical problems to be solved). Theory of production, Law of variable proportion, Law of returns to scale.

Module-II: **(12 hours)**

Time value of money – Simple and compound interest, Cash flow diagram, Principle of economic equivalence. Evaluation of engineering projects – Present worth method, Future worth method, Annual worth method, internal rate of return method, Cost-benefit analysis in public projects. Depreciation policy, Depreciation of capital assets, Causes of depreciation, Straight line method and declining balance method.

Module-III: **(12 hours)**

Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis-Linear approach. (Simple numerical problems to be solved)

Banking: Meaning and functions of commercial banks; functions of Reserve Bank of India. Overview of Indian Financial system.

Text Books:

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India.

2. D.M. Mithani, Principles of Economics. Himalaya Publishing House

Reference Books :

1. Sasmita Mishra, "Engineering Economics & Costing ", PHI

2. Sullivan and Wicks, " Engineering Economy", Pearson

3. R.Paneer Seelvan, " Engineering Economics", PHI

4. Gupta, " Managerial Economics", TMH

5. Lal and Srivastav, " Cost Accounting", TMH

PCPR 4201 Manufacturing Processes- I

Module-I

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, investing casting, centrifugal casting, loan moulding, transfer moulding. Solidification Principles, design of moulds, risering, sprues and gating system, casting defects.

Module-II

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.

Module-III

 1. Basic Joining Process Types of welding –gas welding –are welding –shielded Metal arc welding, GTAW, GMAW, SAW, ESW-Résistance welding (sport, seam , projection , percussion , flash type) –Atomic hydrogen arc welding –thermit welding –shouldering , brazing and braze welding ,

 2. Design of Weldments Welding symbol – position of welding –joint and groove design – weld stress –calculation – design of weld size-estimation of weld dilution, heat input and preheat and post heat temperature – computer application in weld design .

 3. Special welding process Electron Beam and Laser beam welding –plasma arc welding – stud welding- friction welding- explosive welding- ultra sonic welding h-under water welding - roll bonding – diffusion bonding – cold welding –welding of plastic, dissimilar metal.

Text: 1. Khanna O.P., "A Welding Technology", Khanna Publishers.
        2. Manufacturing Technology: Foundry, Forming and Welding by P.N. Rao, TMH.

References
1. Principles of manufacturing Materials and processes, by James S. Campbell, TMH.
2. Welding Metallurgy by G.E. Linnert, AWS.
3. Production Engineering Sciences by P.C. Pandey and C.K. Singh, Standard Publishers Ltd.
 4. Manufacturing Science by A. Ghosh and A.K. Mallick, Wiley Eastern.

PCPR 4202: MEASUREMENT AND METROLOGY

Module-I **(8 Hours)**
MECHANICAL MEASUREMENTS **(4+2+2=8)**

Introduction: Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, units of measurement, static performance characteristics and elementary idea of dynamic performance characteristics of measurement devices, calibration, concept of error (systematic and random), sources of error, statistical analysis of errors. 4

Sensors and Transducers: Types of sensors, types of transducers and their characteristics. 2

Signal Transmission and Processing: Signal transmission and processing devices and systems. Signal display & recording devices 2

Module-II **(10 Hours)**
Time Related Measurements: **(2+1+2+2+3=10)**

Stroboscope, frequency measurement by direct comparison. Measurement of displacement

Measurement of Pressure: Gravitational, directing acting, elastic and indirect type pressure transducers. Measurement of very low pressures (high vacuum).

Strain Measurement: Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration.

Temperature Measurement: Thermometers, bimetallic thermocouples, thermistors and pyrometers.

Measurements of Force, Torque, Acceleration, and Vibration: Different types of load cells, elastic transducers, pneumatic & hydraulic systems. Seismic instruments, accelerometers vibration pick ups and decibel meters, vibrometers.

Module-III **(14 Hours)**
Measurement of Fluid Velocity and Flow rate: **(2+2+2+1=7)**

Measurement of fluid velocity, Hot Wire Anemometry, Laser Doppler Velocimetry. Flow measuring devices, Rotameter.

METROLOGY Metrology and Inspection : Standards of linear measurement, line and end standards. Limit fits and tolerances. Interchangeability and standardisation.

Linear and angular measurements devices and systems Comparators: Sigma, Johansson's Microkrator.

Limit gauges classification, Taylor's Principle of Gauge Design.

Measurement of Surface **(2+1+2+1+1=7)**

Measurement of geometric forms like straightness, flatness, roundness.

Tool makers microscope, profile project autocollimator.

Interferometry: principle and use of interferometry, optical flat.

Measurement of screw threads and gears.

Surface texture: quantitative evaluation of surface roughness and its measurement.

Books and References:
1. Experimental Methods for Engineers by Holman, TMH
2. Mechanical Measurements by Beckwith, Pearson
3. Principles of Measurement Systems by Bentley, Pearson
4. Metrology of Measurements by Bewoor and Kulkarni, TMH
5. Measurement Systems, Application Design by Doeblein, TMH
6. Hume K.J., "Engineering Metrology", MacDonald and Co
7. Jain, R.K., "Engineering Metrology" Khanna Publishers
8. Jain, R.K., "Mechanical Measurement" Khanna Publishers

PCME4203 INTRODUCTION TO PHYSICAL METALLURGY AND ENGINEERING MATERIALS

MODULE-I **(16 Lectures)**

Classification of Engineering Materials, Engineering properties of materials. Characteristic property of metals, bonding in solids, primary bonds like ionic, covalent and metallic bond, crystal systems, common crystal structure of metals, representations of planes and directions in crystals, atomic packing in crystals, calculation of packing density, voids in common crystal structures and imperfections crystals.

Concept of plastic deformation of metals, critical resolve shear stress, dislocation theory, deformation by slip and twin, plastic deformation in polycrystalline metals, yield point phenomenon and related effects, concept of cold working preferred orientation. Annealing ; recovery; recrystalization and grain growth; hot working.

MODULE-II **(16 Lectures)**

Concept of alloy formation, types of alloys, solid solutions, factors governing solids solubility viz. size factor, valency factor, crystal structure factor and chemical affinity factor; order-disorder transformation.

Binary phase diagrams a) Isomorphism system, (b) Eutectic system, (c) Peritectic system, (d)Eutectoid system and (e) Peritectoid system. Allotropic transformation. Lever rule and its application, Interpretation of solidification behaviors and microstructure of different alloys belonging to those systems, Effect of non-equilibrium cooling, coring and homogenization.

Iron-cementite and iron-graphite phase diagrams, microstructure and properties of different alloys (alloy steels; stainless steel, tool steel, HSS, high strength low alloy steel) types of cast iron, their microstructures and typical uses. Specification of steel. T.T.T. diagram: concept of heat treatment of steels i.e. annealing, normalizing, hardening and tempering; microstructural effects brought about by these processes and their influences on mechanical properties; factor affecting hardenability.

MODULE-III **(12 Lectures)**

Optical properties of Materials: Scattering, Refraction, Theory of Refraction and absorption, Atomic Theory of optical properties. Lasers, Optical fibres- Principle, structure, application of optical fibres.

Plastic-: Thermosetting and thermoplastics.

Ceramics: Types, structure, Mechanical properties, application

Composite Materials: Agglomerated Materials: Cermets .Reinforced Materials: Reinforced Concrete. Glass fiber reinforced plastics, Carbon fibre reinforced plastics, fibre reinforced plastics, Laminated plastic sheets. Tefnol, Properties of composites,

Metal matrix composites, manufacturing procedure for fiber reinforced composite.

Introduction to Nano-materials

Text Books:

1. Engineering Physical Metallurgy and Heat Treatment by Y.Lakhtin, Mir Publisher, Moscow.

2. Introduction to Physical Metallurgy by Avner, Tata McGraw Hill

3. Materials Science and Engineering by W.D.Callister, Wiley and Sons Inc.

Reference Books :

1. Elements of Material Science and Engineering, L.H.Van Vlack, Addison Wesley

2. Physical Metallurgy: Principles and Practice by Ragahvan, PHI

3. The Science and Engineering of Materials by Donald R. Askeland and Pradeep P Phule, Thomson Learning (India Edition)

4. Materials Science and Engineering by V.Raghavan, Prentice Hall of India Pvt.Ltd.

5. Essentials of Material Science and Engineering by Donald R. Askeland and Pradeep P Phule, Thomson Learning

6. Processes and Material of manufacture by Lindberg, PHI.

7. Elements of Materials Science & Engineering by Van Vlack, Pearson

8. Mechanical Metallurgy by Dieter, Tata MacGraw Hill

9. Materials Science and Metallurgy By Daniel Yesudian, Scitech

10. Material Science and Metallurgy by C.K.Dutta, Dhanpat Rai

11. Materials Science and Metallurgy by R.B.Choudhary, Khanna Publishers

12. Principles of Engineering Metallurgy by L.Krishna Reddy, New Age International

13. Material Science and Processes by S.K.Hazra Chowdhury, Indian Book distributing Co.

14. Engineering Materials, Properties and Selection by Kenneth G. Budinski and Michael K. Budinski, Prentice Hall of India

15. Materials Science by M.S. Vijaya , G.Rangarajan, TMH

PCMF4203 THEORY OF MACHINE

Module-I **(10 Hours)**

Mechanism: Basic Kinematic concepts and definitions, mechanism, link, kinematic pair, classification of kinematic pairs, degree of freedom, kinematic chain, binary ternary and quaternary joints and links, degrees of freedom for plane mechanism, grubler's equation, inversion of mechanism, four bar chains and their inversions, single slider crank chain, double slider crank chain and their inversion.

Module-II **(13 Hours)**

Friction of a screw and nut, square threaded crew, V-threaded screw, pivot and collar, friction circle, friction axis, friction clutches, transmission of power by single plate, multiplate and cone clutches.

Gear trains: simple train, compound train, reverted train, epicyclic train and their application. Toothed gears: Theory of shape and action of tooth properties methods of generation of standard Tooth profiles, Standard proportions, Interference and Under-cutting,

Module-III **(12 Hours)**

Cams: Simple harmonic, constant velocity and constant acceleration types. Displacement, velocity and acceleration of follower. Cams with specified Contours.

Governors: Centrifugal Governors-watt and Porter Governors, Spring loaded Governor-Hartnell Governor ,sensitiveness, stability, Isochronism ,Hunting,
Balancing: Balancing of revolving masses in one plane and different planes, Partial balance of single cylinder engine.

TEXT BOOK

1. Theory of machines – SS Ratan, Tata McGraw Hill.
2. A Textbook of theory of machines (in S.I units) – R.K. Bansal, Laxmi Publication.

REFERENCES

1. Mechanism and machine Theory- Rao and Dukkipati, Wiley Eastern Ltd.
2. Theory of Machines –Thomas Beven.

Measurement & Metrology Lab.

LIST OF EXPERIMENTS

1. Calibration of Dial gauge, Micrometer, Vernier and Height gauge
2. Use of Sine bar for measuring angles
3. Study and use of Profile Projector
4. Measurement of thread parameters using Floating Carriage Micrometer
5. Surface roughness measurement
6. Use of Mechanical and Pneumatic comparator
7. Measurement of gear tooth thickness
8. Measurement of Internal, External angles and Bores using standard Balls, and Height gauge.
9. Measurement of Straightness and Flatness using precision level.
10. Study and use of Toolmaker's microscope
11. Study of Digital measuring instruments

MANUFACTURING TECHNOLOGY LAB- I

LIST OF EXPERIMENTS

Measurement of the Machined Components and Machining time estimation of:

1. Taper Turning

2. External thread cutting

3. Internal thread cutting

4. Eccentric Turning

5. Knurling

6. Square Head Shaping

7. Hexagonal Head Shaping

8. Drilling and Tapping

9. Determination of Cutting forces in Turning and Milling Operations.

REFERENCES

1. Hajra Choudhury, S.K and Hajra Choudhury. A.K., " Elements of Workshop Technology', Volume I and II, Media Promoters and Publishers Private Limited, Mumbai, 1997.

2. Sharma, P.C.A Text book of Production Technology, S. Chand and Co. Ltd., 2004.

3. Roy. A. Lindberg, "Process and Materials of Manufacture", Pearson Education Fourth Edition 2006

COMPUTER AIDED DESIGN LAB

1. Basic concepts of CAD/CAM.
2. Introduction to Fundamentals of AutoCAD with operating system commands/menus, familiarization with computerized drafting software use at help and tutorial menus.
3. Introduction to CAD tools and commands. To draw 2D basic shapes. Lines, curves, areas, circles etc.
4. Modify tools: copy, more, offset, array etc. Working with Blocks.
5. Dimensioning, Use of layers, & Drawing template. To draw simple 2D drawing.
6. Printing, export, import of CAD files in different format like jpg, dxf any dwg dwt., iges, stl. etc.
7. Introduction solid modeling of 3D components using sketching and feature like extrude, revolve, sweep, fillet etc.
8. Over view of projection of solid standard views, sectional views, and detail views.
9. Creating assembly drawing.
10. Development of drawing surface features.
11. Projection of different solid models.
12. Thread profiles Nomenclature types – Metric, BSP, BCW, ACME, Buttress, and Knuckle thread.
13. Nut & bold and fasteners.
14. Machining assemblies: Gib and cotton joint, shaft coupling.
15. Making one screw jack assembly and its 2D drawing and parts lists generation with bill of materials.

Text Books:
1. Machine Drawing by N.D.Bhatt, V.M.Panchal, Charotar Publishing House.
2. Machine Drawing with AutoCAD by Goutam Pohit and Goutam Ghosh, Pearson Education
3. Machine Drawing includes AutoCAD by Ajeet Singh, Tata MacGraw Hill
4. Machine Drawing (Includes AutoCAD) by Ajeet Singh, Tata McGraw Hill
5. Engineering Drawing with an Introduction to AutoCAD by Dhanjay A. Johle, Tata McGraw Hill

Reference Books:
1. Engineering Drawing and Graphics using AUTOCAD by T.Jayapoovan, Vikas Publishing
2. Engineering Drawing by N.D.Bhatt, Charotar
3. Engineering Drawing and Graphics + AutoCAD by K. Venugopal, New Age International
4. Design Data Book, PSG Technology, Coimbatore

BSCM1210 **Mathematics – IV**

Module-I **(20 hours)**
Numerical Methods:
Approximation and round of errors, Truncation error and Taylor's series Roots of equation: The bisection method, the false-position method, fixed point iteration, the Newton-Raphson method, Muller's method

Linear algebraic equation: LU decomposition, the matrix inverse, Gauss-Seidel method Interpolation: Newton divided difference interpolation, Lagrange Interpolation, Newton's forward and backward interpolation.

Numerical integration: The trapezoidal rule, The Simpson's rules, Gauss quadrature Ordinary differential equation: Euler's method, Improvement of Euler's method, Runge-Kutta methods

Module-II **(10 Hours)**
Probability:
Probability, Random variables, Probability distributions, Mean and variance of distribution, Binomial, Poisson and Hypergeometric distributions, Normal distribution, Distribution of several random variables.

Module-III **(10 Hours)**
Mathematical Statistics:
Random sampling, Estimation of Parameters, Confidence Intervals, Testing of hypothesis, Acceptance sampling, Chi square test for goodness of fit , Regression Analysis, Fitting Straight Lines, Correlation analysis.

Text books:
1. S. C. Chapra and R. P. Canale, " *Numerical methods for Engineers*", Fifth Edition, McGraw Hill Education
Reading Chapters: 2, 3(3.1, 3.2), 4(4.2, 4.3), 5(5.1, 5.2, 5.3), 6(6.4), 9(9.1, 9.2), 10(10.2), 13(13.1,13.2,13.5), 16(16.1, 16.2), 17(17.3), 20(20.1, 20.2, 20.3)

2. E. Kreyszig," Advanced Engineering Mathematics:, Eighth Edition, Wiley India
Reading Chapters: 22, 23(except 23.5 and 23.8)

Reference books:
1. Jay L. Devore, "Probability and Statistics for Engineering and Sciences",

Seventh Edition, Thomson/CENGAGE Learning India Pvt. Ltd
P. V.O'Neil, "Advanced Engineering Mathematics", CENGAGE Learning, New Delhi

HSSM 3205   **ORGANIZATIONAL BEHAVIOUR**

Module I

The study of Organizational Behaviour: Definition and Meaning, Why Study OB
Learning – Nature of Learning, How Learning occurs, Learning and OB.

Foundations of Individual Behaviour: Personality – Meaning and Definition, Determinants of Personality, Personality Traits, Personality and OB.

Perception – Meaning and Definition, Perceptual Process, Importance of Perception in OB. Motivation – Nature and Importance, Herzberg's Two Factor Theory, Maslow's Need Hierarchy Theory, Alderfer's ERG Theory, Evaluations.

Module II

Organizational Behaviour Process : Communication – Importance, Types, Gateways and Barriers to Communication, Communication as a tool for improving Interpersonal Effectiveness, Groups in Organizations – Nature, Types, Why do people join groups, Group Cohesiveness and Group Decision-making Managerial Implications, Effective Team Building. Leadership-Leadership & Management, Theories of Leadership-Trait theory, Leader Behaviour theory, Contingency Theory, Leadership and Follower ship, How to be an effective Leader, Conflict-Nature of Conflict and Conflict Resolution. An Introduction to Transactional Analysis (TA).

Module-III

Organization : Organizational Culture – Meaning and Definition, Culture and Organizational Effectiveness. Introduction to Human Resource Management-Selection, Orientation, Training and Development, Performance Appraisal, Incentives Organizational Change – Importance of Change, Planned Change and OB techniques. International Organisational Behaviour – Trends in International Business, Cultural Differences and Similarities, Individual and Interpersonal Behaviour in Global Perspective.

Text Books:
1. Keith Davis, Organisational Behaviour, McGraw-Hill.
2. K. Aswathappa, Organisational Behaviour, Himalaya Publishing House.

Reference Books :
1. Stephen P. Robbins, Organisational Behaviour, Prentice Hall of India
2. Pradip N. Khandelwal, Organizational Behaviour, McGraw-Hill, New Delhi.
    3. Uma Sekaran, "Organizational Behaviour", TATA McGraw-Hill, New Delhi.
   4. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma" Organizational Behaviour" , TATA McGraw- Hill.
5. D.K. Bhattachayya, "Organizational Behaviour", Oxford University Press
6. K.B.L.Srivastava & A.K.Samantaray, "Organizational Behaviour" India Tech
7. Kavita Singh, "Organizational Behaviour", Pearson

PCPR4203   MANUFACTURING PROCESSES-II

Module-I   **(16 Hours)**
Basic shapes of machine tools. Wedge action, function of different angles of cutting tools, tool geometry, and Nomenclatures ASA, ORS systems. Conversion of angles, geometry of twist drill & slab milling cutter, grinding of single point cutting tool. Tool materials.

Force system in turning- Merchant circle diagram, velocity relationship .Stress in conventional shear plane, Energy of cutting process, Ernst & Merchant angle relationship, Forces in drilling and plane slab milling. Measurement of forces-dynamometer for measuring turning & drilling forces.

Module-II   **(10 Hours)**
Mechanism of chip formation: Mode of failure under stress- fracture & yielding mechanism.

Thermodynamics of chip formation: The shear plane temperature-interface temperature from dimensional analysis-Experimental determination of chip tool interface temperature. Coolants-mechanism cooling action

Module-III   **(8 Hours)**
Tool wear: Criteria of wear. Machinability and tool life, Flank wear.
Taylor's tool life equation, Crater wear, Causes and mechanism of tool failure.
 Vibration & chatter in machining. Economics of metal machining.

TEXT BOOK(S):
1. Metal cutting Theory & Practice- A.Bhattacharya, C.B.Pub.
2. Production Technology- P.C Sharma.

REFERENCE(S):
1. Fundamentals of Metals machining & machine Tools- Boothroyd- International student Edition.
2. Theory of Metal cutting- Milton Shaw

PEPL5307   STRENGTH OF MATERIALS

Module I   **(15 hours)**
Elasticity: Stress and strain, compressive, tensile, shear and bearing stress - Stress - strain diagram, Hooks law, modulus of elasticity, modulus of rigidity, bulk modulus of rigidity, bulk modulus, Poisson's ration. Relationship between elastic constraints and temperature stresses, composite bars, dead, live and shock loads.
Properties of section, calculation of areas, centroid, neutral axis, moment of inertia, modulus of section, radius of gyration with reference to structural shapes.

Module II   **(15 hours)**
Theory of simple bends - relationship between load shearing force and bending moment. Bending moment and shear force diagram for cantilever, simple supported and over hanging beams - bending stresses.
Deflection - deflection of beams in simple cases. Principal stresses and stains.
Torsion in solid and hollow shafts - combined bending and torsion.

Module III   **(15 hours)**
Thin and thick cylinders and shells subjected to internal and external pressures.
Column and struts - long and short columns - axial and eccentric loading - effect of end conditions – equivalent length and slenderness ratio - Euler and Rankine formulae.

References Books:

1. R.S. Khurmi, Applied Mechanics and Strength of Materials S.Chand & Co., (6th ed), New Delhi, 1987.
2. P.N. Singh and I.K.Jha, Elementary Mechanics and Solids, Wiley Eastern, New Delhi.
3. Timoshenko, Strength of Materials
4. Singer, Strength

PCPR 4204 **Hydraulics and Hydraulic Machines**

Module I (13 Lectures)

Introduction : Scope of fluid mechanics and its development as a science

Physical property of Fluid: Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

Fluid statics: Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer.

Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface.

Buoyancy and floatation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.

Fluid kinematics : Introduction, description of fluid flow, classification of fluid flow. Reynold's number, Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity,

Mathematical definitions of irrotational and rotational motion. Circulation, potential function and stream function. Flow net

Module II (12 Lectures)

Fluid dynamics : Introduction, Euler's equation along a streamline, energy equation, Bernoulli's equation and its application to siphon, venturimeter, orificemeter, pitot tube.

Flow in pipes and ducts: Loss due to friction, Minor energy losses in pipes Hydraulic Gradient Line (HGL), Total Energy Line (TEL), Power transmission in the fluid flow in pipes, fluid flow in pipes in series and parallel. Flow through nozzles.

Module III (15 Lectures)

Hydraulic turbine: Classification, Impulse and Reaction turbine; Tangential, Radial and axial turbine.

Impulse turbine, Pelton wheel, bucket dimensions, number of buckets in pelton wheel, efficiency and performance curves.

Reaction Turbines: Francis turbine and Kaplan turbine, velocity triangle and efficiencies, performance curve. Function of draft tube and casing cavitation

Centrifugal Pump: constructional features, vane shape, velocity triangles, Efficiencies, Multi stage centrifugal pumps, Pump Characteristic, NPSH and Cavitation.

Positive displacement pumps: Reciprocating Pump, Working principle, Discharge, work done and power requirement, Slip, Indicator diagram

Text Books

1. Fluid Mechanics and Hydraulic Machines, Modi & Seth
2. Introduction to Fluid Mechanics and Fluid Machines by S.K. Som and G. Biswas, TMH
3. Fluid Mechanics, A.K.Jain, Khanna Publishers

Reference Books:

1. Fluid Mechanics by A.K. Mohanty, PHI
2. Introduction to Fluid Mechanics by Fox, McDonald, Willey Publications
3. Fluid Mechanics by Kundu, Elsevier
4. An Introduction to Fluid Dynamics by G.K.Batchelor, Cambridge University Press
5. Engineering Fluid Mechanics by Garde et. al., Scitech
6. First course in Fluid Mechanics by Narasimhan, University press
7. Fluid Mechanics by J.F.Douglas, J.M.Gasiorek, J.A.Swaffield and L.B.Jack, Pearson

PCMF4205   WORK STUDY & ERGONOMICS

Module I   **(10 hours)**

Introductory Concepts

Definition, objective and scope of work study and ergonomics and its historical background, Interrelationship between work study & ergonomics, role of work study & ergonomics in productivity improvement

Method Engineering

Definition, objectives and procedure of method analysis, Principles of motion economy and methodology of motion analysis.

Module II   **(10 hours)**

Work Measurement

Definition, objective and different methods of work measurement – stop watch time study, predetermined motion time system (PMTS)

Work Sampling

Principle, techniques and applications of work sampling studies

Module III   **(13 hours)**

Job Evaluation and Merit Rating

Definition, objectives and techniques of job evaluation and merit rating

Wages & Salary

Definition and principles of wage and salary administration, comparative study of incentive schemes

Ergonomics

Man – machine interaction, design of man-machine environment system, workstation design

TEXT BOOKS

1. Motion & Time Study Barnes Ralph. M., John Wieley & Sons, 7th edition.
2. Work Study O. P. Khanna, Dhanpat Rai & sons, New Delhi
3. Motion and Time study – Principles and Practice M.E.MUNDEL PRENTICE Hall India Pvt. Ltd.
4. Introduction to work Study – ILO
5. Human Factors in Engineering Design – E.J.McCormick, Tata Mc-GrawHill
6. Hand book of Ergonomic Design – Martin Helender

PCPR7204   MANUFACTURING PROCESS LAB – II.

LIST OF EXPERIMENTS
1. Measurement of cutting force in drilling.
2. Measurement of cutting force in milling.
3. Measurement of cutting force in turning.
4. Temperature measurement in turning.
5. Vibration study of machine tools.
6. Verification of Taylor's tool life equation.
7. Study of different types of chips.
8. Determination of shear angles.
9. Ring Compression test.
10. Determination of coefficient of friction by using compression tests.
11. Formability test-Ericsson cupping test.

PCPR7205   MATERIAL TESTING LAB

Material Testing:
LIST OF EXPERIMENTS

1. Impact strength
2. Hardness strength
3. Rigidity modulus
4. Compression / Bending strength
5. Fatigue strength
6. Determination of tensile strength of materials by Universal Testing Machine

PCPR7204   Fluid Mechanics & Hydraulic Machines Lab

LIST OF EXPERIMENTS

HYDRAULIC MACHINE:
1. Experiments on impact of Jets
2. Experiments on performance of reciprocating pump
3. Experiments on performance of centrifugal pump
4. Experiments on performance of Pelton Turbine
5. Experiments on performance of Francis Turbine
6. Experiments on performance of Kaplan Turbine

FLUID MECHANICS

7. Determination of Metacentric Height and application to stability of floating bodies.
8. Verification of Bernoulli's Theorem and its application to Venturimeter.
9. Determination of Cv and Cd of Orifices.

BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ODISHA
PRODUCTION ENGINEERING

5th SEMESTER				6th SEMESTER			
Theory		*Contact Hrs*	*Credit*	*Theory*		*Contact Hrs*	*Credit*
		L-T-P				L-T-P	
HSSM 3302	Optimization Engineering	3-0-0	3	PCME 4404	Production and Operation Management	3-0-0	3
HSSM 3303	Environmental Engineering and Safety	3-0-0	3	PCMF 4302	Tool Design	3-0-0	3
PCME 4303	Design of Machine Elements	3-0-0	3	PCME 5306	CAD/CAM	3-0-0	3
PCPR 4301	Principle of Machine Tools	3-0-0	3	PCMF 4301	Materials Deformation Process	3-0-0	3
	Professional Elective - I (Any one)	3-0-0	3		**Professional Elective - II (Any one)**	3-0-0	3
PEMF 5302	Advanced Casting and Welding			FEME 6301	Finite Element Methods		
PEMF 5303	Maintenance Engineering and Management			PETX 5412	Management Information System		
PEME 5303	Rapid Prototyping			PEME 5305	Robotics and Robotics Apllication		
	Free Elective - I (Any one)	3-0-0	3		**Free Elective - II (Any one)**	3-0-0	3
PEME 5408	Composite Material			PEME 5308	Non Conventional Energy Sources		
FEME 6302	Project Management			FEME 6303	Heat Power Engineering		
PEME 5304	Tribology			PEIT 5301	E Commerce		
BECS 2212	C++ and Object Oriented Programming						
	Credits (Theory)		18		Credits (Theory)		18
	PRACTICALS/SESSIONALS				*PRACTICALS/SESSIONALS*		
PCMF 7305	Metallurgy and NDT Lab	0-0-3	2	PCMF 7304	Tool Design Sessional	0-0-3	2
PCMF 7302	Machine Design Sessional	0-0-3	2	PCPR 7301	NTM Lab	0-0-3	2
PCMF 7305	Manufacturing Lab-3(Machine Shop)	0-0-3	2	PCMF 7301	Manufacturing Lab-4	0-0-3	2
	Credits (Practicals / Sessionals)		6		Credits (Practicals / Sessionals)		6
	TOTAL SEMESTER CREDITS		24		TOTAL SEMESTER CREDITS		24
	TOTAL CUMULATIVE CREDITS		133		TOTAL CUMULATIVE CREDITS		157

PRODUCTION ENGINEERING   *5th semester*

HSSM3302 OPTIMIZATION ENGINEERING   (3-0-0)

Module-I   (10 Hours)

 Idea of Engineering optimization problems, Classification of optimization algorithms, Modeling of problems and principle of modeling. Linear programming: Formulation of LPP, Graphical solution, Simplex method, Big-M method, Revised simplex method, Duality theory and its application, Dual simplex method , Sensitivity analysis in linear programming

Module-II   (10 Hours) Transportation problems: Finding an initial basic feasible solution by Northwest Corner rule, Least Cost rule, Vogel's approximation method, Degeneracy, Optimality test, MODI method, Stepping stone method Assignment problems: Hungarian method for solution of Assignment problems Integer Programming: Branch and Bound algorithm for solution of integer Programming Problems Queuing models: General characteristics, Markovian queuing model, M/M/1 model, Limited queue capacity, Multiple server, Finite sources, Queue discipline.

Module-III   (10   Hours)
Non-linear programming: Introduction to non-linear programming.   Unconstraint optimization: Fibonacci and Golden Section Search method. Constrained optimization with equality constraint: Lagrange multiplier, Projected gradient method Constrained optimization with inequality constraint: Kuhn-Tucker condition, Quadratic programming Introduction to Genetic Algorithm.

Recommended text books

1. A. Ravindran, D. T. Philips, J. Solberg, " Operations Research- Principle and Practice", Second edition, Wiley India Pvt Ltd
2. Kalyanmoy Deb, " Optimization for Engineering Design", PHI Learning Pvt   Ltd
Recommended Reference

 Books:
1.Stephen G. Nash, A. Sofer, " Linear and Non-linear Programming", McGraw Hill
2. A.Ravindran, K.M.Ragsdell, G.V.Reklaitis," Engineering Optimization",   Second edition, Wiley India Pvt. Ltd
 3.H.A.Taha,A.M.Natarajan, P.Balasubramanie, A.Tamilarasi, "Operations Research", Eighth Edition, Pearson Education
4. F.S.Hiller, G.J.Lieberman, " Operations Research", Eighth Edition, Tata McDraw Hill 5. P.K.Gupta, D.S.Hira, "Operations Research", S.Chand and   Company Ltd.

HSSM3303 ENVIRONMENTAL ENGINEERING & SAFETY (3-0-0)

Module - I
Ecological Concepts: Biotic components, Ecosystem Process: Energy, Food Chain, Water cycle, Oxygen cycle, Nitrogen cycle etc., Environmental gradients, Tolerance levels of environment factor, EU, US and Indian Environmental Law. Chemistry in Environmental
Engineering: Atmospheric chemistry, Soil chemistry. Noise pollution- Noise standards,
measurement and control. Water Treatment: water quality standards and parameters,
Ground water. Water treatment processes, Pre-treatment of water, Conventional process,
Advanced water treatment process.

Module - II :

(a)Waste Water Treatment: DO and BOD of Waste water treatment process, pretreatment, primary and secondary treatment of waste water, Activated sludge treatment: Anaerobic digestion, Reactor configurations and methane production.
(b)Air Pollution   : Air pollution and pollutants, criteria pollutants, Acid deposition, Global climate change -greenhouse gases, non-criteria pollutants, air pollution meteorology, Atmospheric dispersion. Industrial Air Emission Control. Flue gas desulphurization, NOx removal, Fugitive emissions.
(c) Solid waste, Hazardous waste management, Solid Waste Management, Source classification and composition of MSW: Separation, storage and transportation, Reuse and recycling, Waste Minimization Techniques. Hazardous Waste Management, Hazardous waste and their generation, Transportation and treatment: Incinerators, Inorganic waste treatment. E.I.A., Environmental auditing,

Module - III : Occupational Safety and Health Acts, Safety procedures, Type of Accidents, Chemical and Heat Burns, Prevention of Accidents involving Hazardous substances, Human error and Hazard Analysis. Hazard Control Measures in integratednsteel industry, Petroleum Refinery, L.P.G. Bottling, Pharmaceutical industry. Fire Prevention - Detection, Extinguishing Fire, Electrical Safety, Product Safety. Safety Management- Safety Handling and Storage of Hazardous Materials, Corrosive Substances, Gas Cylinders, Hydro Carbons and Wastes. Personal Protective Equipments.

Text Book :
1. Environmental Engineering Irwin/ McGraw Hill International Edition, 1997, G. Kiely,
2. Environmental Engineering by Prof B.K. Mohapatra, Dhanpat Rai & Co Publication
3. Industrial Safety Management, L. M. Deshmukh, Tata McGraw Hill Publication.

Reference Books
1. Environmental Engineering by Arcadio P. Sincero & Gergoria A. Sincero PHI Publication
2. Principles of Environmental Engineering and Science, M. L. Davis and S. J. Masen, McGraw Hill International Edition, 2004
3. Environmental Science, Curringham & Saigo, TMH,
4. Man and Environment by Dash & Mishra
5. An Introduction to Environmental Engineering and Science by Gilbert M. Masters & Wendell P. Ela - PHI Publication.
6. Industrial Safety Management and Technology, Colling. D A - Prentice Hall, New Delhi

PCME4303 DESIGN OF MACHINE ELEMENTS (3-1-0)

Module-I (12 hours)

Stages in design, Standardization, Interchangeability, Preferred numbers, Fits and Tolerances, Engineering materials, Ferrous, Non-ferrous, Non-metals, Indian standard specifications for Ferrous materials, Fundamentals of Machine Design, Allowable stress, Factor of safety, Use of Code/Data books.

Design of Joints: Riveted joints, Boiler joints, Welded and bolted joints based on different types of loading. Illustrative problems with solutions.

Module-II (14 hours)

Design of Cotter joints with socket and spigot, with a Gib. Design of knuckle joint. Illustrative problems with solutions.

Design of shafts, solid and hollow based on strength and on rigidity. Illustrative problems with solutions.

Design of keys and pins, Suck key, Feather key, Taper pin. Illustrative problems with solutions.

Design of shaft couplings : Rigid Flange coupling, Flexible Flange coupling.

Module-III (14 hours)

Design of circular section, Helical springs, Tension and compression types, Design of leaf springs: Cantilever and semi-elliptical types. Illustrative problems with solutions. Levers, classification, Design of Foot levers, Hand lever, Cranked lever, Lever of lever loaded - safety - valve. Design of belt and pulley Power screw design with square thread, such as screw jack. Illustrative problems with solutions.

[Only specified data book as mentioned in the syllabus is permitted during examination]

TEXT BOOKS:

1. Mechanical Engineerng Design, J.E.Shigley, C.R.Mischke, R.G.Budynas and K.J.Nisbett, TMH

2. Machine Design, P.Kanaiah, Scietech Publications

REFERENCE BOOKS:

1. Design of Machine Elements, V.B. Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition 2007.

2. Machine Design, P.C.Sharma and D.K.Agrawal, S.K.Kataria & Sons

3. Machine Design, Pandya and Shah, Charotar Book Stall

4. Machine Design, Robert L. Norton, Pearson Education Asia, 2001.

5. Machine Design, A CAD Approach: Andrew D Dimarogonas, John Wiley Sons, Inc, 2001.

6. Fundamentals of Machine Component Design, Robert C. Juvinall and Kurt M Marshek, Wiley India Pvt. Ltd., New Delhi, 3rd Edition, 2007

7. A Text Book of Machine Design, R.S.Khurmi and J.K.Gupta, S.Chand Publication

8. Machine Design, H.Timothy and P.E.Wentzell, Cengage Learning

9. Computer Aided Analysis and Design, S.P.Regalla, I.K.International Publishing

DESIGN DATA HAND BOOKS:

1. P.S.G.Design Data Hand Book, PSG College of Tech Coimbature

2. Design Data Hand Book, K. Lingaiah, McGraw Hill, 2nd Ed. 2003.3. Design Hand Book by S.M.Jalaluddin ; Anuradha Agencies Publications

PRINCIPLE OF MACHINE TOOLS

Module-1   **14 Hrs**

conventional machining process and machine tools-Turning, Drilling, Shaping, Planning, Milling, Grinding Machine tools for these processes, their specifications and various techniques used, calculation of cutting time, speed, feed ,MRR etc.

Module-2

principle of machine tools: kinematics of machine tools ,speed transmission from motor to spindle, speed reversal mechanism, mechanism for feed motion, Tool holding and job holding methods in different machine tools, Types of surface generated, Indexing mechanism and thread cutting mechanism, Quick return mechanism.

Module-3

Production Machine tools-Capstan and turret lathes, single spindle and multi spindle semiautomatics, Gear shaper and Gear hopping machines, Coping lathe and transfer machine

PROFESSIONAL ELECTIVE-I
PEMF5302 ADVANCED CASTING & WELDING (3-0-0)

MODULE- I   (12 hours)
MELTING AND POURING: Principles of melting practice-fluxing- Degasification and inoculation- types of furnaces- Crucibles, Cupola, Oil fired furnaces - Electric arc and induction furnaces -Melting practice of cast iron, SG iron, steel, aluminium and copper alloys.
CASTING DESIGN: Solidification of pure metals and alloys-shrinkage in cast metals-design of sprue, runner, gate and risers-problems in design and manufacture of thin and unequal sections designing for directional solidification, minimum distortion and for overall economy - design problems of L, T, V, X and Y junctions.

MODULE II   (10 hours)
WELD DESIGN AND WELDING METALLURGY: Design of welded components-symbolic representation of welds on drawings- welding classes-residual stresses in welds-weld distortions-design consideration-strength consideration of welded joints-analysis of statistically loaded welded joints-welded structures subjected to fatigue loads.

MODULE III   (12 hours)
SPECIAL CASTING AND WELDING PROCESSES: Evaporative pattern casting-ceramic mould casting -electro magnetic moulding-squeeze casting -investment casting-shell moulding-PAW-electron beam welding-laser beam welding- friction welding-ultrasonic welding -diffusion welding-high velocity oxy fuel processes
QUALITY CONTROL AND AUTOMATION : Cleaning and inspection of castings - Casting defect and remedies - foundry automations-moulding machines-Automation of sand plant, moulding and fettling sections of foundry-Dust and fume control-Welding defects -causes and remedies -Non Destructive tests - arc welding using robots-weld positioner and manipulators -weld seam tracking-vision system-arc sensing welding

TEXT BOOKS
1. PARMAR, R.S., Welding Processes and Technology, Khanna Publishers, 1997.
2. JAIN, P.L., Principles of Foundry Technology, Tata McGraw Hill, 2003.
REFERENCES
1. A.S.M Hand book, vol 15, casting, ASM international, 1988
2. KLAS WEMAN, welding processes hand book, CRC press, 2003
3. CARY and HOWARD,B., Modern Welding Technology, Prentice-Hall, 1989.
4. HEINE, R.W., LOPER.L.R., and ROSENTHAL,C, Principles of Metal Casting, TMH
5. MINKOFF,J., solidification and cast structure,wiley.1986
6. DAVIES, A.C., Welding (10th Edition), Cambridge University Press, 1996.

PEMF5303 MAINTENANCE ENGINEERING & MANAGEMENT (3-0-0)

MODULE- I   (12 hours)

 MAINTENANCE CONCEPTS:

Objectives and functions - Tero technology - Reliability Centered Maintenance (RCM) - maintainability prediction - availability and system effectiveness- maintenance costs   - maintenance organization, Minimal repair   - maintenance types   - balancing PM and breakdown maintenance- PM schedules: deviations on both sides of target values - PM schedules: functional characteristics - replacement models

MODULE- II   (10 hours)

TOTAL PRODUCTIVE MAINTENANCE: Zero breakdowns - Zero Defects and TPM - maximizing equipment effectiveness - autonomous maintenance program - five pillars of TPM - TPM small group activities - TPM organization - management decision - educational campaign - creation of organizations - establishment of basic policies and goals - formation of master plan. - TPM implementation

MODULE- III   (13 hours)

 MAINTENANCE LOGISTICS : Human factors in maintenance - maintenance manuals - maintenance staffing methods - queuing applications - simulation - spare parts management - maintenance planning and scheduling

 DIAGNOSTIC MAINTENANCE: Leak detection-wear monitoring-Temperature monitoring Vibration monitoring-Signature analysis-Shock monitoring-Lubricant-Analysis-Methodology-Equipments-Applications

 ONLINE MONITORING: Condition Monitoring Techniques- Vibration Monitoring, Signature Analysis - Wear Debris Monitoring - Maintenance Management Information System - Expert systems -Corrosion Monitoring and Control

TEXT BOOKS

1. Seiichi Nakajima, Introduction to TPM, Productivity Press, Chennai, 1992.

2. Gopalakrishnan, P. and Banerji, A.K., Maintenance and Spare Parts Management,

3. Prentice - Hall of India Pvt. Ltd., 1991.

REFERENCES

1. Goto, F., "Equipment planning for TPM Maintenance Prevention Design", Productivity Press, 1992.

2. Shirose, K., "Total Productive Maintenance for Workshop Leaders", Productivity Press, 1992.

3. Shirose, K., "TPM for Operators", Productivity Press, 1996.

4. Suzuki, T., "New Directions for TPM", Productivity Press, 1993.

        5. Kelly, A.., "Maintenance Planning and Control", Butterworth, London, 1991.

PEMF5404RAPID PROTOTYPING (3-0-0)

MODULE -I   **(12 hours)**

INTRODUCTION: History - Development of RP systems - Applications in Product Development, Reverse Engineering, Rapid Tooling, Rapid Manufacturing- Principle - Fundamental - File formatOther translators - medical applications of RP - On demand manufacturing - Direct material deposition - Shape Deposition Manufacturing.

LIQUID BASED AND SOLID BASED RAPID PROTOTYPING SYSTEMS: Classification - Liquid based system - Stereo lithography Apparatus (SLA), details of SL process, products, Advantages, Limitations, Applications and Uses. Solid based system- Fused Deposition Modeling, principle, process, products, advantages, applications and uses - Laminated Object Manufacturing

MODULE -II   **(11hours)**

POWDER BASED RAPID PROTOTYPING SYSTEMS: Selective Laser Sintering - principles of SLS process, principle of sinter bonding process, Laser sintering materials, products, advantages, limitations, applications and uses. Three Dimensional Printing - process, major applications, research and development. Direct shell production casting -key strengths, process, applications and uses, case studies, research and development. Laser Sintering System, e-manufacturing using Laser sintering, customized plastic parts, customized metal parts, e-manufacturing - Laser Engineered Net Shaping (LENS).

MODULE -III   **(12hours)**

MATERIALS FOR RAPID PROTOTYPING SYSTEMS: Nature of material - type of material -polymers, metals, ceramics and composites liquid based materials, photo polymer development -solid based materials, powder based materials - case study.

REVERSEENGINEERING AND NEW TECHNOLOGIES :Introduction, measuring device-contact type and non-contact type, CAD model creation from point clouds-pre-processing, point clouds to surface model creation, medical data processing - types of medical imaging, software for making medical models, medical materials, other applications - Case study.

TEXT BOOKS

1. Rafiq I. Noorani, Rapid Prototyping - Principles and Applications, Wiley & Sons, 2006.
2. Chua C.K, Leong K.F and Lim C.S, Rapid Prototyping: Principles and Applications, second edition, World Scientific, 2003.

REFERENCES

1. N.HOPKINSON, R.J.M, HAUGE, P M, DICKENS, "Rapid Manufacturing - An Industrial revolution for the digital age", Wiley, 2006
2. IAN GIBSON, "Advanced Manufacturing Technology for Medical applications: Reverse Engineering, Software conversion and Rapid Prototyping", Wiley, 2006
3. Paul F.Jacobs, Rapid Prototyping and Manufacturing, "Fundamentals of Stereo lithography", McGraw Hill 1993.
4. D.t.Pham and S.S.Dimov, "Rapid Manufacturing", Springer Verlog 2001.

FREE ELECTIVES -I

PEME5408 COMPOSITE MATERIALS

Module - I   **(14 hours)**

1. Introduction :

Classification and characteristics of composite materials, mechanical behaviour of composites, constituents, Reinforcements, Matrices, Fillers, Additives, Applications and advantages of composites.

2. Processing :

Initial form of constituent materials, Manufacturing procedures for fibre-reinforced plastics, quality control.

3. Macromechanical Behaviour :

Stress strain relations of anisotropic materials - Engineering constants for orthotropic materials, Stress strain relations for specially orthotropic lamina. Transformation relationships for a lamina of arbitrary fibre orientation.

Module - II   **(12 hours)**

Testing of Composites, Evaluation of Engineering Constants and Strengths.

Micromechanical Analyses of orthotropic lamina, Evaluation of Engineering Constants using Micromechanical principles, Rules of Mixtures, Kelly Davis Model for Minimum and Critical Volume Fractions.

Module - III   **(10 hours)**

FRP Composite Laminate designation and codes, Macromechanical Behaviour of FRP Composite Laminates, Classical Lamination Theory.

General Design Consideration and Suitable laminating Scheme.

Text Book

1. Mechanics of Composite Materials, R.M. Jones, Mc. Graw Hill Book Co.

Reference Book :

1.Fibre - Reinforced composites :- Materials, manufacturing and Design by P.K. Mallick, CRC Press.

2.Engineering Mechanics of Composite Materials, I.M.Danel, O.Issai, Oxord University Press

3. Composite materials, Broutman & Crock,

4. Principles of Composite Material Mechanics, R.F.Gibson, CRC Press

FEME6302 PROJECT MANAGEMENT

Module-I

Project Management Concepts and Needs Identification Attributes of a Project, Project Life Cycle, The Project management Process, Benefits of Project Management, Needs Identification, Project Selection, Project organization, the project as part of the functional organization. Project feasibility Analysis: Technical feasibility, commercial and financial visibility, Environment Analysis.

Module-II

Project Planning and Scheduling: Design of project management system; project work system; work breakdown structure,
project execution plan, work packaging plan, project procedure manual; project scheduling; bar charts, line of balance (LOB) and Network Techniques (PERT / CPM)/ GERT, Resource allocation, Crashing and Resource Sharing, capacity planning and expansion capacity decision.

Module III

Project Monitoring and Control and Project Performance Planning, Monitoring and Control; Design of monitoring system; Computerized PMIS (Project Management Information System). Coordination; Procedures, Meetings, Control; Scope/Progress control, Performance control, Schedule control, Cost control, Performance Indicators; Project Audit; Project Audit Life Cycle, Responsibilities of Evaluator/ Auditor, Responsibilities of the Project Manager.

Books:

1. Project Planning, Analysis, Selection, Financing, Prasana Chandra, TMH

2. Project Management, Grey, TMH.

3. Project Management, Richman, PHI

4. Project Management, Vasant Desai, HPH

5. Project Management, Bhavesh M.Patel, Vikash

6. Project Engineering & Management- Prasanna Chandra, Prentice Hall.

PEME5304   TRIBOLOGY

MODULE- I   (12 hours)

Study of various parameters: Viscosity, flow of fluids, viscosity and its variation -absolute and kinematic viscosity, temperature variation, viscosity index determination of viscosity, different viscometers used. Hydrostatic lubrication: Hydrostatic step bearing, application to pivoted pad thrust bearing and other applications, hydrostatic lifts, hydrostatic squeeze films and its application to journal bearing.

MODULE -II   (11 hours)

Hydrodynamic theory of lubrication: Various theories of lubrication, petroffs equation, Reynold's equation in two dimensions -Effects of side leakage - Reynolds equation in three dimensions, Friction in sliding bearing, hydro dynamic theory applied to journal bearing, minimum oil film thickness, oil whip and whirl anti -friction bearing.

MODULE- III   (12 hours)

 Concept of gas lubricated bearing -Concept of Elastohydrodynamic lubrication -Friction and power losses in journal bearings: Calibration of friction loss friction in concentric bearings, bearing modulus, Sommerfield number, heat balance, practical consideration of journal bearing design considerations. Air lubricated bearing: Advantages and disadvantages application to Hydrodynamic journal bearings, hydrodynamic thrust bearings. Hydrostatic thrust bearings. Hydrostatic bearing Analysis including compressibility effect. Bearing materials: General requirements of bearing materials, types of bearing materials.

TEXT BOOKS:

1. Fundamentals of Tribology, Basu, SenGupta and Ahuja/PHI
2. Tribology in Industry: Sushil Kumar Srivatsava, S. Chand &Co. REFERENCE:
1. Introduction to Tribology of Bearings - B.C. Majumdar, S. Chand & Co.
2. Tribology - Hutchins, Asterix Publishers(1992)
3. Tribology - Lambert M Surhone, Miriam T Timpledon, Susan F Marseken, Betascript Publishing(2010)

BECS2212 C++ AND OBJECT ORIENTED PROGRAMMING

Module I   (08 hrs)
Introduction to object oriented programming, user defined types, structures, unions, polymorphism, encapsulation. Getting started with C++ syntax, data-type, variables, strings, functions, default values in functions, recursion, namespaces, operators, flow control, arrays and pointers.

Module II   (16 hrs)
Abstraction mechanism: Classes, private, public, constructors, destructors, member data, member functions, inline function, friend functions, static members, and references.
Inheritance: Class hierarchy, derived classes, single inheritance, multiple, multilevel, hybrid inheritance, role of virtual base class, constructor and destructor execution, base initialization using derived class constructors.
Polymorphism: Binding, Static binding, Dynamic binding, Static polymorphism: Function Overloading, Ambiguity in function overloading, Dynamic polymorphism: Base class pointer, object slicing, late binding, method overriding with virtual functions, pure virtual functions, abstract classes.
Operator Overloading: This pointer, applications of this pointer, Operator function, member and non member operator function, operator overloading, I/O operators.
Exception handling: Try, throw, and catch, exceptions and derived classes, function exception declaration.

Module III   (08 hrs)

Dynamic memory management, new and delete operators, object copying, copy constructor, assignment operator, virtual destructor.
Template: template classes, template functions.
Namespaces: user defined namespaces, namespaces provided by library.

Text Books:
1.   Object Oriented Programming with C++ - E. Balagurusamy, McGraw-Hill Education (India)
2.   ANSI and Turbo C++ - Ashoke N. Kamthane, Pearson Education

Reference Books:

1.   Big C++ - Wiley India
2.   C++: The Complete Reference- Schildt, McGraw-Hill Education (India)
3.   "C++ and Object Oriented Programming" - Jana, PHI Learning.
4.   "Object Oriented Programming with C++ "- Rajiv Sahay, Oxford
5.   Mastering C++ - Venugopal, McGraw-Hill Education (India)
"Object Oriented Programming with C++", David Parsons, Cengage Learning.

PCMF7302   MACHINE DESIGN SESSIONAL (0-0-3)

LIST OF EXPERIMENTS:

1. Design of coupling -Rigid & flexible type
2. Design of riveted joints (under axial & eccentric loading)
3. Design of Welded joints (under axial & eccentric loading)
4. Design of cotter & knuckle joint
5. Design & Analysis of leaf & Helical springs under various loading
6. Design of Piston
7. Design of Connected rod/crankshaft,
8. Design of Spur gear under various loading
9. Design of Helical & bevel gear under various loading
10. Design of Screw Jack under various loading
11. Practice in computer aided design of some of the above mentioned design using 3D Software

PCMF 7303   MANUFACTURING LABORATORY - III   (0-0-3)
(DYNAMIC LAB)

LIST OF EXPERIMENTS:
1. a) Study of gear parameters.
   b) Experimental study of velocity ratios of simple, compound, Epicyclic and differential 20 gear trains.
2. a) Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker, Oscillating cylinder Mechanisms.
   b) Kinematics of single and double universal joints.
3. a) Determination of Mass moment of inertia of Fly wheel and Axle system.
   b) Determination of Mass Moment of Inertia of axis symmetric bodies using Turn Table apparatus.
   c) Determination of Mass Moment of Inertia using bifilar suspension and compound pendulum.
4. Motorized gyroscope - Study of gyroscopic effect and couple.
5. Governor - Determination of range sensitivity, effort etc., for Watts, Porter, Proell, and Hartnell Governors.
6. Cams - Cam profile drawing, Motion curves and study of jump phenomenon
7. a) Single degree of freedom Spring Mass System - Determination of natural frequency and verification of Laws of springs - Damping coefficient determination.
   b) Multi degree freedom suspension system - Determination of influence coefficient.
8. a) Determination of torsional natural frequency of single and Double Rotor systems.- Undamped and Damped Natural frequencies.
   b) Vibration Absorber - Tuned vibration absorber.
9. Vibration of Equivalent Spring mass system - Undamped and damped vibration.
10. Whirling of shafts - Determination of critical speeds of shafts with concentrated Loads.
11. a). Balancing of rotating masses.
    b). Balancing of reciprocating masses.
12. a) Transverse vibration of Free-Free beam - with and without concentrated masses.
    b) Forced Vibration of Cantilever beam - Mode shapes and natural frequencies.
    c) Determination of transmissibility ratio using vibrating table.

PCMF7305 METALLURGY & NON DESTRUCTIVE TESTING LAB.

1.Microstructure analysis of steel (Mild, Medium carbon, High carbon, Hardened & Spheroidised Steel), Cast iron

2. Jominy and Quench test apparatus

3. Microstructure analysis of Non ferrous alloys

4. Heat treatment of steel

5. Cooling curve experiment

6. Liquid penetrant test

7. Ultrasonic flaw detection

8. Magnetic particle testing

9. Eddy current testing.

PRODUCTION ENGINEERING   6th Semester

PCME4404   PRODUCTION AND OPERATION MANAGEMENT (3-0-0)

Objective : The course aims at acquainting all engineering graduates irrespective of their specializations the basic issues and tools of managing production and operations functions of an organization.

Module -I   (11 Hours)

1. Operations Function in an Organization, Manufacturing Vrs Service Operations, System view of Operations, Strategic Role of Operations, Operations Strategies for Competitive Advantage, Operations Quality and Productivity Focus, Meeting Global Challenges of Production and Operations Imperatives.
2. Designing Products, Services and Processes: New Product Design- Product Life Cycle, Product Development Process, Process Technology : Project, Jobshop, Batch, Assembly Line, Continuous Manufacturing; Process Technology Life Cycle, Process Technology Trends, FMS, CIM, CAD, CAM; Design for Services, Services Process Technology.
3. Work Study: Methods Study- Techniques of Analysis, recording, improvement and standardization; Work Measurement : Work Measurement Principles using Stopwatch Time Study, Predetermined Motion Time Standards and Work Sampling, Standard Time Estimation.

Module II   (13 Hours)
4. Location and Layout Planning : Factor Influencing Plant and Warehouse Locations,
Impact of Location on cost and revenues. Facility Location Procedure and Models :
Qualitative Models, Breakeven Analysis, location Model, centroid method.
Layout Planning: Layout Types : Process Layout, Product Layout, Fixed Position Layout
Planning, block diagramming, line balancing, computerized layout planning- overview.
Group Technology
5. Forecasting : Principles and Method, Moving Average, weighted Moving Average, Exponential Smoothing, Winter's Method for Seasonal Demand, Forecasting Error.
6. Manufacturing Planning and Control : The Framework and Components : Aggregate Planning, Master Production Scheduling, Rough-cut-Capacity Planning, Material Requirements Planning, Capacity Requirements Planning.
Module III   (11 Hours)
7. Sequencing and Scheduling : Single Machine Sequencing : Basics and Performance Evaluation Criteria, Methods for Minimizing Mean Flow Time, Parallel Machines : Minimization of Makespan, Flowshop sequencing : 2 and 3 machines cases : Johnson's Rule and Jobshop Scheduling : Priority dispatching Rules.

8. Inventory Control : Relevant Costs, Basic EOQ Model, Model with Quantity discount, Economic Batch Quantity, Periodic and Continuous Review Systems, Safety Stock, Reorder Point and Order Quantity Calculations. ABC Analysis.

9. Modern Trends in Manufacturing : Just in Time (JIT) System : Shop Floor Control By Kanbans, Total Quality Management, Total Productive Maintenance, ISO 9000, Quality Circle, Kaizen, Poka Yoke, Supply Chain Management.
Reference Book:
1. S.N.Chary, "Production and Operations Management", Tata McGraw Hill.
2. R. Paneerselvam, "Production and Operations Management, Prentice Hall of India.
3. Aswathappa & Bhatt - Production & Operations Management, HPH.
4. Gaither & Frazier - Operations Management, Cengage Publication
5. Russell & Taylor - Operations Management, PHI Publication
6. Chase, Aquilanno, Jacob & Agarwal - Operations Management, TMH Publication.
7. E.E. Adam and R.J. Ebert "Production and Operations Management", Prentice Hall of India

PCMF4301   MATERIALS DEFORMATION PROCESSES   (3-1-0)

MODULE I   (16 hours)

INTRODUCTION TO METAL FORMING: Classification of Forming Processes   - Temperature in Metal working - Hot and Cold working - Introduction to the theory of Plastic Deformation.

THEORY AND PRACTICE OF BULK FORMING PROCESSES :Analysis of plastic deformation in Forging, Rolling, Extrusion and rod/wire drawing processes - Effect of friction, calculation of forces, work done - Process parameters, equipment used - Defects - applications - Recent advances in Forging, Rolling, Extrusion and drawing processes - Experimental techniques of evaluation of friction in metal forming.

MODULE II   (14 hours)

SHEET METAL FORMING: Conventional processes - H.E.R.F. techniques - Super plastic forming techniques - Principles and process parameters - Advantages, limitations and applications.

SPECIAL FORMING PROCESSES: Orbital forging - Isothermal forging - Hot and cold Isostatic pressing - High speed extrusion - Rubber pad forming - Water hammer forming - Fine blanking.

MODULE III   (10 hours)

POWDER METALLURGY FORMING: Overview of P/M technique   - Advantages   - applications - Powder perform forging - powder rolling - Tooling and process parameters.

TEXT BOOK

1. George E. Dieter, Mechanical Metallurgy, McGraw Hill International Book Company, 1988.

REFERENCES

1. Schuler - Metal forming hand book - Springer verlag publication, 1998.

2. Hosford, WF and CAD Dell, R.M. - Metal forming : Mechanics and Metallurgy, Prentice Hall, Englewood Cliffs, 1993.

3. Narayanasamy,R - Theory of Metal Forming Plasticity, Narosa Publishers, New Delhi Nagpal,G.R - Metal Forming Processes, Khanna Publishers, 1988.

4. Chakrabarthy,J - Theory of Plasticity, McGraw Hill Co, 1987.

5. Altan T - Metal Forming - Fundamentals and applications - American Society of Metals.

PCMF4302   TOOL DESIGN   (3-0-0)

Module-I   (12 hours)

INTRODUCTION: Tool design objectives   - types of tools, Principles of design and construction of jigs and fixtures, principles of location and clamping, locating and clamping devices, Analysis of clamping force-Tolerance and error analysis.

JIGS: Different types of jigs-plate latch, channel, box, post, angle plate, angular post, turnover, pot jigs-Automatic drill jigs-Rack and pinion operated. Air operated Jigs components. Drill bushes Design and development of Jigs for given components.

FIXTURES: General principles of boring, lathe, milling and broaching fixtures- Grinding, planning and shaping fixtures, assembly, Inspection and welding fixtures- Modular fixtures. Design and development of fixtures for given components.

MODULE- II   (12 hours)

PRESS WORKING:

Terminologies and elements of dies and strip layout. Press working terminology-Presses and press accessories-Computation of capacities and tonnage requirements. Elements of progressive, combination and compound dies: Die block-die shoe. Bolster plate-punch platepunch holder-guide pins and bushes - strippers -knockouts-stops - pilots-Selection of standard die sets strip lay out-strip lay out calculations.

MODULE -III   (11 hours)

DESIGN AND DEVELOPMENT OF DIES:

Design and development of progressive and compound dies for Blanking and piercing operations. Bending dies - development of bending dies-forming and drawing dies-Development of drawing dies. Design of tools for production of holes, surfaces of revolution, and flat surfaces like single point cutting tools, drills, form tools and milling cutters. Economics of toolings.

(Use of approved design data book is permitted)

TEXT BOOKS

1. Edward G Hoffman, Jigs & Fixture Design, Thomson - Delmar Learning, Singapore 2004

2. Donaldson. C, Tool Design, Tata McGraw-Hill, 1986

REFERENCES

1.   Kempster, "Jigs & Fixtures Design, The English Language Book Society", 1978

2.   Joshi, P.H., "Jigs & Fixtures, Second Edition", TMH Publishing, New Delhi 2004

3.   Hiram E Grant, "Jigs and Fixture" Tata McGraw-Hill, New Delhi, 2003

3.   "Fundamentals of Tool Design", CEEE Edition, ASTME, 1983

4.   PSG College of Technology, Coimbatore - Design Data Handbook

PCMF4303 CAD/CAM FOR MANUFACTURING ENGINEERING (3-0-0)

MODULE I (11 hours)

Computer Graphics: Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal. Geometric modeling : Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

MODULE II (12 hours)

Numerical control: NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools, features of Machining center, turning center, CNC Part Programming: fundamentals, manual part programming methods, Computer Aided Part Programming.

Group Tech: Part family, coding and classification, production flow analysis, advantages and limitations, Computer Aided Processes Planning, Retrieval type and Generative type.

MODULE III (12 hours)

Computer Aided Quality Control: Terminology in quality control, the computer in QC, contact inspection methods, noncontact inspection methods-optical, noncontact inspection methodsno optical, computer aided testing, integration of CAQC with CAD/CAM.

Computer integrated manufacturing systems: Types of Manufacturing systems, Machine tools and related equipment, material handling systems, computer control systems, human labor in the manufacturing systems, CIMS benefits.

TEXT BOOK:

1. CAD / CAM A Zimmers & P.Groover/PE/PHI

2. CAD / CAM Theory and Practice / Ibrahim Zeid / TMH

REFERENCE BOOK:

1. Automation, Production systems & Computer integrated Manufacturing/ Groover/P.E

2. CAD / CAM / CIM / Radhakrishnan and Subramanian / New Age

3. Principles of Computer Aided Design and Manufacturing / Farid Amirouche / Pearson

4. CAD/CAM: Concepts and Applications/Alavala/ PHI

5. Computer Numerical Control Concepts and programming / Warren S Seames / Thomson

PROFESSIONAL ELECTIVE-II

FEME6301   FINITE ELEMENT METHODS   (3-0-0)

Module - I   (12 hours)

Review of 2-D and 3-D stress analyses, vibration, fluid flow and heat conduction problems. FEM fundamental concepts, Variational principles, Rayleigh Ritz and Galerkin Methods. Finite Element Modeling of one dimensional problems. Finite Element Analysis of 2-D and 3-D framed structures.

Module - II   (12 hours)

FEM formulation of 2-D and 3-D stress analysis problems. Axisymmetric solids subjected to axisymmetric loadings. Two-dimensional isoparametric elements and numerical integration.

Module - III   (12 hours)

FE modeling of basic vibration problems Finite element modeling of fluid flow and heat conduction problems Computer programs: preprocessing and post processing. Exposure to commercial FE codes such as ANSYS, NASTRAN and IDEAS etc.

Text Books

1. Finite Elements in Engineering, T.R.Chandraputla and A.D.Belegundu, PHI

2. The Finite Element Method - Its Basis & Fundamentals, Zienkiewicz, Taylor and Zhu, Elsevier, 6th Edn

Reference

1. Introduction to Finite Element Method, C.Desai and J.F.Abel, CBS publishers

2. Introduction to Finite Element Method, J.N.Reddy, Tata McGraw Hill

3. Numerical Methods in Finite Element Analysis, K.J.Bathe and E.L.Wilson, PHI

4. Concepts & Applications of Finite Element Analysis,Cook, D.S.Malkus & M.E.Plesha, Wiley

5. The Finite Element Method in Engineering, S.S.Rao, Elsevier

6. A First Course in the Finite Element Method, D.L.Logan, Cengage Learning

7. Fundamentals of Finite Element Analysis, David V. Hutton, Tata McGraw Hill

PETX5412 MANAGEMENT INFORMATION SYSTEM

Module - I (12 hours)

Overview: Definition of MIS, Data processing and MIS, Characteristics of MIS, Need / importance of MIS in organization, Limitations of MIS; MIS and other disciplines Data and Information; Characteristics of Information; Types of Information - Operational, Tactical and Strategic information; Managers as Information Processors; System Approach: MIS as a system, Sub-systems of MIS - Activity sub-systems, Functional sub-system Decision Making: Decision-making under certainty, risk and uncertainty; Phases of Decisionmaking Process; Decision Models - Classical Economic Model, Administrative Model; Organizational Decision-making Planning for development of MIS: Feasibility Analysis - Technical, Economic, Motivational, Schedule and Operational Feasibility; MIS development as a project;

Module - II (12 hours)

Overview of System Life Cycle Models - Waterfall model, Prototyping model and Spiral model . System Analysis and Design (SAD): Purpose, Requirement engineering, Typical content of System Requirement Specification (SRS), System Design - high level design and low level design, Characteristics of good design - coupling and cohesion

Overview of tools used in SAD - Context diagram, Data Flow Diagram (DFD), Data Dictionary, ER diagram, Structure charts, HIPO documentation, Decision Table, Decision Tree, Pseudocode

Module - III (12 hours)

MIS in Organization: MIS in Marketing; Manufacturing; HRM; Accounting and Finance, Enterprise Resource Planning (ERP) System. Business Intelligence (BI): Role of BI in marketing, finance, human resource, and manufacturing; Overview of DSS, Data Mining and Data Warehouse Implementation of MIS: Critical Success Factor Information System Security, Privacy, Social and Ethical issues

Books:
1. Management Information Systems, M Jaiswal& M Mital, Oxford Univ. Press
2. Information Systems for Modern Management, Murdick, Ross &Claggett, PHI
3. Management Information System, Launden&Launden, Pearson
4. Management Information System, James O Brian, TMH
5. Management Information Systems, A K Gupta, Sultan Chand & Sons
6. Management Information System, Jawadekar, McGraw Hill

PEME5305 ROBOTICS & ROBOT APPLICATIONS (3-0-0)

Module – I

1. Fundamentals of Robotics: Evolution of robots and robotics, Definition of industrial robot, Laws of Robotics, Classification, Robot Anatomy, Work volume and work envelope, Human arm characteristics, Design and control issues, Manipulation and control, Resolution; accuracy and repeatability, Robot configuration, Economic and social issues, Present and future application.

2. Mathematical modeling of a robot: Mapping between frames, Description of objects in space, Transformation of vectors. Direct Kinematic model: Mechanical Structure and notations, Description of links and joints, Kinematic modeling of the manipulator, Denavit-Hartenberg Notation, Kinematic relationship between adjacent links, Manipulator Transformation matrix.

Module – II 3. Inverse Kinematics: Manipulator workspace, Solvable of inverse kinematic model, Manipulator Jacobian, Jacobian inverse, Jacobian singularity, Static analysis. 4. Dynamic modeling: Lagrangian mechanics, 2D- Dynamic model, Lagrange-Euler formulation, Newton-Euler formulation. 5. Robot Sensors: Internal and external sensors, force sensors, Thermocouples, Performance characteristic of a robot.

Module – III 6. Robot Actuators: Hydraulic and pneumatic actuators, Electrical actuators, Brushless permanent magnet DC motor, Servomotor, Stepper motor, Micro actuator, Micro gripper, Micro motor, Drive selection. 7. Trajectory Planning: Definition and planning tasks, Joint space planning, Cartesian space planning. 8. Applications of Robotics: Capabilities of robots, Material handling, Machine loading and unloading, Robot assembly, Inspection, Welding, Obstacle avoidance.

Text Books:
 1. Robotics and Control, R.K. Mittal and I.J. Nagrath, Tata McGraw Hill
2. Introduction to Robotics: Mechanics and control, John J Craig, PHI
3. Robotics Technology and Flexible Automation, S.R.Deb and S. Deb, TMH
Reference Books:
 1. Introduction to Robotics, S. K. Saha, Tata McGraw Hill
2. Robotics: Control, Sensing, Vision and Intelligence, K.S.Fu, R.C.Gonzalez and C.S.G.Lee, McGraw Hill
 3. Robotics, Appuu Kuttan K.K., I.K. international
4. Robot Dynamics and Control, M.W.Spong and M. Vidyasagar , Wiley India.
 5. Industrial Robotics Technology, programming and application, M.P.Groover, TMH.
6. Introduction to Robotics: Analysis, Systems, Applications, S.B.Niku, PHI
 7. Robotics: Fundamental Concepts and Analysis, A. Ghosal, Oxford University Press
8. Fundamentals of Robotics: Analysis and Control, R. J. Schilling, PHI
9. Robotic Engineering: An Integrated Approach, R.D. KLAFTER, T. A. Chmielewski, and M. Negin, PHI
10. Robot Technology: Fundamentals: J. G. Keramas, Cengage Learning

FREE ELECTIVE - II

PEME5308 NON-CONVENTIONAL ENERGY SOURCES   (3-0-0)

Module I   (10 Hours)
Energy, Ecology and environment: Introduction, Classification of Energy Resources, Common Forms of Energy, Energy Chain, Advantages and Disadvantages of Conventional Energy Sources, Importance and Salient Features of Non-Conventional Energy Sources, Environmental and ecological Aspects of Energy use, Environment-Economy-Energy and Sustainable Development, World Energy Status, Energy Scenario in India. Energy Conservation and Energy Storage: Salient Features of "Energy Conservation Act, 2001", Various Aspects of Energy Conservation, Principles of Energy Conservation, General Electrical ECO's (Energy Conservation Opportunities),
Solar Energy: Basics, The Sun as a Source of Energy, Sun, Earth Radiation Spectrums, Extraterrestrial and Terrestrial Radiations, Spectral Energy Distribution of Solar Radiation, Depletion of Solar Radiation, Measurements of Solar Radiation, Solar Time (Local Apparent Time), Solar Radiation Geometry, Solar Day Length, Empirical Equations for Estimating Solar Radiation(Hourly Global, Diffuse and Beam Radiations) on Horizontal Surface Under Cloudless and Cloudy Skies, Solar Radiation on Inclined Plane Surface only (empirical relations for numerical)

Module II   (15 Hours)
Solar Thermal Systems: Solar Collectors: Flat plate and concentric collectors, Solar Water Heater, Solar Passive Space - Heating and Cooling Systems, Solar Refrigeration and AirConditioning Systems, Solar Cookers, Solar Furnaces, Solar Green House, Solar Dryer, Solar Distillation (or Desalination of Water),
Solar Photovoltaic Systems: Solar Cell Fundamentals, Solar Cell Characteristics, Solar Cell Classification, Solar Cell, Module, Panel and Array Construction, Solar PV Systems, Solar PV Applications.
Wind Energy: Origin of Winds, Nature of Winds, Wind Turbine Siting, Major Applications of Wind Power, Wind Turbine Types and Their Construction, Wind Energy Conversion Systems (WECS), Effects of Wind Speed and Grid Condition (System Integration),

Module III   (15 Hours)
Biomass Energy: Photosynthesis Process, Usable Forms of Biomass, their Composition and Fuel Properties, Biomass Resources , Biomass Conversion Technologies, Urban Waste to Energy Conversion, Biomass Gasification ,Biomass Liquefaction, Biomass to Ethanol Production, Biogas Production from Waste Biomass, Energy Farming.
Miscellaneous Non-conventional Technologies
Geothermal Energy: Applications, Origin and Distribution of Geothermal Energy, Types of Geothermal Resource.
Ocean Energy: Tidal Energy, Wave Energy, Ocean Thermal Energy

Fuel Cell Technology: Types, Principle of operation, Advantages and disadvantages.

Text Book:
1. Non Conventional Energy Sources: B.M Khan, TMH Publications
2. Renewable Energy Sources and Emerging Technology: D.P.Kothari and etal., PHI
3. Renewable Energy Sources & Conversion Technology: N.K.Bansal, Manfred Kleenman & Michael Meliss, TMH Publication.

Reference:
1. Renewable Energy Sources:Fundamentals & Applications:G.N.Tiwari & M.K.Ghosal, Narosa Pub
2. Non Conventional Energy Resources: D.S. Chauhan and S.K.Srivastava, New Age International
3. Non Conventional Energy Sources: H.P.Garg
4. Non-Conventional Energy Systems: G.D.Rai, Khanna publications

FEMF6303 HEAT POWER ENGINEERING   (3-0-0)

Module I   (12 Hrs)

Water tube & fire tube boilers, circulating principles, forced circulation, critical pressure, superheaters, reheaters, attemperators, induced draught, forced draught and secondary air fans, boiler performance analysis and heat balance. Combustion systems, environmental protection - esp, cyclone separator, dust collector etc.

Module II   (12 Hrs)

Rotary thermodynamic devices - steam turbines & their classifications - impulse & reaction type turbines, thermodynamics of compressible fluid-flow, equation and continuity - isentropic flow through nozzles, velocity diagram, blade efficiency, optimum velocity ratio, multi-staging, velocity & pressure compounding,

Module III   (11 Hrs)

losses in turbines, erosion of turbine blades, turbine governing, performance analysis of turbine, condensing system.Ic engines - classification. Analysis of a standard cycle, fuel characteristic of si & ci engine, combustion, engine performance. Automotive engine exhaust emission and their control.

Gas turbine analysis - regeneration - reheating, isentropic efficiency. Combustion efficiency.

Text books:

1. P.k.Nag- Engineering Thermodynamics - TMH ,2nd Ed.
2. P k Nag- power plant engg. - TMH publication
3. P.S. Ballaney- thermal engineering - khanna pub
4. Domkundwar & Arora- power plant engineering -.dhanpat rai & co.

Reference books:
1. Cengel --- Thermodynamics , 3/e ,tmh
2. ET-WAKIL—power plant engineering , mh
3. M W ZEMANSKY & R.H.DITTMAN -heat and thermodynamics - MCGRAW HILL ,7th Ed.

PEIT5301 E COMMERCE (3-0-0)

MODULE I:

Introduction to e-business and e-commerce: Introduction, What is the difference between e-commerce and e-business?, How significant are e-commerce and e-business?, Business adoption of digital technologies for e-commerce and e-business, Introducing the B2B and B2C companies, Management responses to e-commerce and e-business.

MODULE II:

E-commerce fundamentals: Introduction, The e-commerce environment, The e-commerce marketplace, Focus on portals, Location of trading in the marketplace, Commercial arrangement for transactions, Focus on auctions, Business models for e-commerce, Revenue models, Focus on internet start-up companies-the dot-coms.

MODULE III:

E-business infrastructure: Introduction, What is the internet?, How does it work? Internet standards, Focus on who controls the internet, Managing e-business infrastructure, Focus on web service and service and service-oriented, Focus on new access devices,

Text Book:

Dave Chaffey, "E-Business and E-Commerce Management", Third Edition,   2009, Pearson Education.

Reference Books:
1. Henry Chan, Raymod Lee and etl., "E-Commerce Fundamental and Applications", Wiley.
2. Brian Mennecke and Troy Strader,   "Mobile Commerce: Technology, Theory and Applications", Idea Group, 2003.
3. Nansi Shi, "Mobile Commerce Applications", IGI Global, 2004.
4. Gary P. Schneider,   "Electronic Commerce", Seventh Edition, CENGAGE Learning India Pvt. Ltd., New Delhi.
5. K. K. Bajaj, D. Nag "E-Commerce", 2nd Edition, McGraw Hill Education, New Delhi
6. P. T. Joseph, "E-Commerce an Indian Perspective", PHI Publication, New Delhi.
7. Bhaskar Bharat, "Electronic Commerce-Technology and Application", McGraw Hill Education, New Delhi

PRACTICALS/SESSIONALS

PCMF7304   TOOL DESIGN LABORATORY

TOOL DESIGN
1. Design and development of dies for Blanking and piercing operations.
2. Exercise on wire drawing die.
3. Exercise on Press tool Design.
4. Exercise on Forging Die Design.
5. Exercise on Plastics Mould Design.
   a. Two Plate / Three plate
   b. Three Plate Mould

A. SIMULATION
1. MATLAB basics, Dealing with matrices, Graphing-Functions of one variable and two
variables
2. Use of Matlab to solve simple problems in vibration and Laplace Transforms
B. ANALYSIS
1. Stress analysis of a plate with a circular hole.
2. Stress analysis of rectangular L bracket
3. Stress analysis of an axi-symmetric components
4. Stress analysis of beams (Cantilever, Simply supported, Fixed ends)
5. Mode frequency analysis of a 2 D component
6. Mode frequency analysis of beams (Cantilever, Simply supported, Fixed ends)
7. Harmonic analysis of a 2D component
8. Transient analysis of spring mass system
9. Spectrum analysis of spring mass system
10. Thermal stress analysis of a axisymmetric component
11. Conductive heat transfer analysis of a 2D component
12. Convective heat transfer analysis of a 2D component

NTM LABORATORY

"will be updated soon"

PCMF 7301 MANUFACTURING LABORATORY-IV(NC LAB)

"will be updated soon"

7th SEMESTER				8th SEMESTER			
Theory		Contact Hrs		Theory		Contact Hrs	
Code		L-T-P	Credit	Code		L-T-P	Credit
PCMF 4402	STASTICAL QUALITY CONTROL & RELIABILITY	3-0-0	3	PCMF 4404	FLEXIBLE MANUFACTURING SYSTEM AND ROBOTICS	3-0-0	3
PCMF4401	NON TRADITIONAL MACHINING	3-0-0	3	FEMT 6041	TOTAL QUALITY MANAGEMENT	3-0-0	3
	Professional Elective - III (Any one)	3-0-0	3		Professional Elective - V (Any one)	3-0-0	3
PEME 5413	MACHINERY FAULTY DIAGONOSIS AND CONDITION MONITORING			PEMF 5405	STASTICAL METHODS & DESIGN OF EXPERIMENTS		
PEME 5406	SIMULATION, MODELLING & CONTROL			PEMF 5406	COMPUTER INTEGRATED MANUFACTURING		
PEEE 5407	INDUSTRIAL AUTOMATION AND CONTROL			PEMF 5404	PRECISION ENGINEERING		
	Professional Elective - IV (Any one)	3-0-0	3		Free Elective - IV (Any one)	3-0-0	3
PEMF 5401	PRODUCT DESIGN AND DEVLOPMENT			FEMF 6401	SUPPLY CHAIN MANAGEMENT		
PEMF 5402	SURFACE ENGINEERING			PETX 5412	MANAGEMENT INFORMATION SYSTEM		
				PEEE 5406	SOFT COMPUTING		
	Free Elective - III (Any one)	3-0-0	3				
FEME 6401	HUMAN RESOURCES MANAGEMENT						
HSSM 3401	ENTREPRENEURSHIP DEVLOPMENT						
HSSM 3403	MARKETING MANAGEMENT						
	Credits (Theory)		15		Credits (Theory)		12
	PRACTICALS/SESSIONALS				PRACTICALS/SESSIONALS		
PCMF 7401	PROJECT-1	0-0-3	3	PCMF 7404	PROJECT-2	0-0-3	5
PCMF 7405	ENTREPRENEURSHIP PROJECT	0-0-3	2	PEMF 7406	COMPREHENSIVE VIVA VOICE	0-0-3	3
PCMF 7403	SEMINAR-1	0-0-3	2	PCMF 7407	SEMINAR-2	0-0-3	2
	Credits (Practicals / Sessionals)		7		Credits (Practicals / Sessionals)		10
	TOTAL SEMESTER CREDITS		22		TOTAL SEMESTER CREDITS		22
	TOTAL CUMULATIVE CREDITS		178		TOTAL CUMULATIVE CREDITS		200

PCMF 4402 STATISTICAL QUALITY CONTROL & RELIABILITY (3-0-0)

MODULE -I(12 hours)

STATISTICAL QUALITY CONTROL:
Methods and Philosophy of Statistical Process Control - Control Charts for Variables and Attributes -Cumulative sum and Exponentially weighted moving average control charts -Other SPC Techniques - Process - Capability Analysis - Six sigma concept.

ACCEPTANCE SAMPLING:
Acceptance Sampling Problem - Single sampling plans for attributes -
double sampling -multiple sampling - sequential sampling   - Military standards - The Dodge Roming sampling plans - Random sampling.

MODULE -II(13 hours)

RELIABILITY ENGINEERING:
Definition of reliability- Performance and reliability- Reliability requirements - Life Testing - System life cycle - Mean time between failures – Mean time to failure - Mortality Curve - Availability - Maintainability.

FAILURE DATA ANALYSIS: Statistical failures of components - failute distributions - Bath tub curve - Negative exponential distribution - Normal distribution - log normal distribution - Gamma distribution - Weibull distribution Life distribution measurements - Accelerated life tests -Data requirements for reliability.

MODULE -III(10 hours)

RELIABILITY PREDICTION AND MANAGEMENT:
Failure rate estimates - Effect of environment and stress - Series and Parallel systems - RDB analysis - Standby Systems - Complex Systems - Reliability demonstration testing - Reliability growth testing - Duane curve - Risk assessment - FMEA and Fault tree analysis.

TEXT BOOKS
1. Khanna, O.P., Statistical Quality Control, Dhanpat Rai Publications (P) Ltd., 2001.
2. Lewis, E.E., Introduction to Reliability Engineering, John Wiley and Sons, 1987.

REFERENCES
1. Mohamed Zairi, "Total Quality Management for Engineers ", Woodhead Publishing Limited 1991.
2. HarvidNoori and Russel, " Production and Operations Management - Total Quality and Responsiveness ", McGraw-Hill Inc, 1995.
3. Douglus C. Montgomery, " Introduction to Statistical Quality Control ", 2nd Edition, John Wiley and Sons, 1991.
4. Klaasssen , H.B. and Van Peppen, J.C.L., System reliability concepts and applications, Edward Arnold, 1989.

PCMF 4401 NON TRADITIONAL MACHINING (3-0-0)

MODULE -I(11 hours)
INTRODUCTION: History, Classification, comparison between conventional and Non-conventional machining process selection. Ultra sonic machining (USM): Introduction, equipment, tool materials & tool size, abrasive slurry, cutting tool system design:- Effect of parameter: Effect of amplitude and frequency and vibration, Effect of abrasive grain diameter, effect of applied static load, effect of slurry, tool & work material, USM process characteristics: Material removal rate, tool wear, Accuracy, surface finish, applications, advantages & Disadvantages of USM.

MODULE -II(12 hours)
ABRASIVE JET MACHINING (AJM): Introduction, Equipment, Variables in AJM: Carrier Gas, Type of abrasive, size of abrasive grain, velocity of the abrasive jet, mean number. Applications, advantages & Disadvantages of AJM. Water Jet Machining: Principal, Equipment, Operation, Application, Advantages and limitations of water Jet machinery ELECTROCHEMICAL MACHINING (ECM): Introduction, study of ECM machine, elements of ECM process: Cathode tool, Anode work piece, source of DC power, Electrolyte, chemistry of the process, ECM Process characteristics - Material removal rate, Accuracy, surface finish, ECM Tooling: Applications such as Electrochemical turning, Electrochemical Grinding, Electrochemical Honing, deburring, Advantages, Limitations.

MODULE -III(12 hours)
ELECTRICAL DISCHARGE MACHINING (EDM): Introduction, machine, mechanism of metal removal, dielectric fluid, spark generator, EDM tools (electrodes) Electrode feed control, Electrode manufacture, Electrode wear , EDM tool design choice of machining operation electrode material selection, under sizing and length of electrode , machining time. Application EDM accessories / applications, electrical discharge grinding, Traveling wire EDM.

PLASMA ARC MACHINING (PAM): Introduction, equipment non-thermal generation of plasma, selection of gas, Mechanism of metal removal, PAM parameters, process characteristics. Safety precautions, Applications, Advantages and limitations.LASER BEAM MACHINING (LBM): Introduction, equipment of LBM mechanism of metal removal, LBM parameters, Process characteristics, Applications, Advantages & limitations.

TEXT BOOKS:
1. Advanced machining processes / VK Jain/ Allied Publishers.

REFERENCE BOOKS:
1. Modern Machining Process / Pandey P.C. and Shah H.S./ TMH.
2. New Technology / Bhattacharya A/ the Institution of Engineers, India 1984.

PEME 5413 MACHINERY FAULT DIAGNOSTICS AND CONDITION MONITORING (3-0-0)

Module – I

Principles of Maintenance, Fault analysis planning and system availability: Failure modes, effects and criticality analysis (FMECA), Failure effects assessment (FEA), Critical areas assessment, Fault tree method, Availability concepts, Failure prediction/reliability assessment Data Processing and Signal Analysis: Computer-Aided Data Acquisition, Time Domain Analysis, Frequency Domain Analysis - Fast Fourier Transform Performance trend monitoring: Primary monitoring – performance, Primary and secondary performance parameters, Performance trend analysis

Module – II

Vibration Analysis: Vibration monitoring equipment, System monitors and vibration limit detectors, vibration monitoring experience Discrete frequencies: Introduction, Simple vibrations, Gear excitation, Rolling element bearings, Blade vibration, Fans and Pumps and Case Studies on Vibration Monitoring Contaminant analysis: Contaminants in used lubricating oils, Carrier fluid degradation, Contaminant monitoring techniques (Wear processes), Oil degradation analysis, Abrasive particles in lubrication oil, Abrasive particle in bearings, Abrasive particle in hydraulic systems, Dissolved gas fault monitoring

Module – III

Electric Motor Current and Signature Analysis Non-Destructive Test and Evaluation technology: Overview: Radiography, Ultrasonics: Principle, transducers, equipments and testing Liquid Penetrant Test, Magnetic Particle Test, Eddy Current Test. Other Topics: Thermal Infrared Imaging, Acoustic Emission, Leak Testing Industrial Applications of NDE Text Books 1. Mechanical Fault Diagnosis and Condition Monitoring by Ralph Albert Collacott, Wiley (or Chapman and Hall, 1977)

Reference Books
1. Condition Based Maintenance and Machine Diagnostics, John W Williams, Alan Davies, Paul R Drake, Springer, 2006
2. Rotating Machinery Vibration; From Analysis to Troubleshooting, Maurice L. Adams, Jr., CRC Press
3. Lubrication and Maintenance of Industrial Machinery; Best Practices and Reliability, R.M.Gresam and G.E.Totten, CRC Press
4. Vibration, Monitoring and Diagnosis: Techniques for Cost-effective Plant Maintenance by Ralph Albert Collacott, 1979, Wiley
5. Handbook on Condition Monitoring, B.K.N. Rao, Elsevier Science 1998
6. Handbook of Condition Monitoring Techniques and Methodology, M.Davies, Springer 2006
7. Vibratory Condition Monitoring of Machines", J.S.Rao, CRC Press, 2000
8. Vibration Monitoring, Testing, and Instrumentation, Editor(s): Clarence W. de Silva, University of British Columbia, Vancouver, Canada, Series: Mechanical Engineering Series, CRC Press (Taylor & Francis)
9. Non-destructive Test and Evaluation of Materials, J.Prasad and C.G.K.Nair, Tata-McGraw-Hill 10. Machinery Condition Monitoring and Trouble Shooting, John S. Mitchell

PEME 5406 SIMULATION MODELLING & CONTROL (3-0-0)

Module I   14 hours

Basic simulation modeling, Discrete event simulation, Simulation of queuing and te Carlo simulations.inventory systems, Continuous, Discrete-continuous and Mon   Statistical models in simulation, Discrete and continuous distributions, Poisson process, Empirical distribution, Generation of pseudo random numbers, Analysis of simulation data, Parameter estimation, Goodness-of-fit tests, Multivariable time series models.

Module II   12hours

Overview of feedback control systems, Dynamics of mechanical systems, Differential equations and state variable form, Models of electromechanical, Heat-and fluid flow models, Linearization and scaling, Models from experimental data, Dynamic response using pole-zero locations, Time domain specifications, Classical 3-term controllers and its digital implementation, Stability analysis by Routh Criterion.

Modules III   10 hours

Simulation of manufacturing and material handling systems, Goals and performance measures, Modeling downtime and failures, Trace driven models, Case studies.

Text Books :

1. Discrete-Event system simulation by Jerry Banks, J.S. Carson, B.L. Nelson and D.M. Nicol (Pearson Publications).
2. Feedback control of dynamic systems by G.F. Franklin, J.D. Powell, A-Naeini, Pearson Publications.
3. Simulation modeling and analysis by A.M. Law, W.D. Kelton, Tata McGrawHill Publications.

PEEE 5407 INDUSTERIAL AUTOMATION & CONTROL (3-0-0)

Module I: (12 Hours)

Process Control: Introduction: Process Definition, Feedback Control, PID Control, Multivariable Control. (Chapter 1 of Text Book 1) PID Controller Tuning: Introduction, Zeigler-Nichols Tuning Method (Based on Ultimate Gain and Period, and Process Reaction Curve), Digital PID Controllers. (Chapter 13 of Text Book 2)

Module II: (15 Hours)

Special Control Structures: Cascade Control, Feedfroward Control, Feedfroward- Feedback Control Configuration, Ratio Control, Selective Control, Adaptive Control, Adaptive Control Configuration. (Chapter 10 and 11 of Text book 3) Actuators: Introduction, Pneumatic Actuation, Hydraulic Actuation, Electric Actuation, Motor Actuators and Control Valves. (Chapter 8 of Text Book 1)

Module III: (10 Hours)

Industrial Automation: Programmable Logic Controllers: Introduction, Principles of operation, Architecture, Programming (Programming Languages, Ladder Diagram, Boolean Mnemonics) (Chapter 5 of Text Book 1) Distributed Control: Distributed vs. Centralized, Advantages, Functional Requirements, System Architecture, Distributed Control Systems (DCS), Communication options in DCS. (Chapter 6 of Text Book 1) Real-time Programming: Multi-tasking, Task Management, Inter-task Communication, Real-time Operating System. (Chapter 9 of Text Book 1)

Text Books:
1. Krishna Kant, "Computer-Based Industrial Control", PHI, 2009.
2. M. Gopal, "Digital Control and State Variable Methods" Tata McGraw Hill, 2003.
3. Surekha Bhanot, Process Control: Principles and Applications, Oxford university Press, 2010.

Reference Books:
1. Smith Carlos and Corripio, "Principles and Practice of Automatic Process Control", John Wiley & Sons, 2006.
2. Jon Stenerson, "Industrial Automation and Process Control", Prentice Hall, 2003.
3. C. Johnson, "Process Control Instrumentation Technology", PHI, New Delhi 4. D.R. Coughnowr, "Process System analysis and Control", McGraw Hill.

PEMF 5401 PRODUCT DESIGN & DEVELOPMENT (3-0-0)

MODULE -I (11 hours)

Need for IPPD - Strategic importance of Product development - integration of customer, designer, material supplier and process planner, Competitor and customer Behaviour analysis. Understanding customer prompting customer understanding involve customer in development and managing requirements. Organization process management and improvement - Plan and establish product specifications.

CONCEPT GNERATION AND SELECTION:

Task - Structured approaches - clarification - search -externally and internally -explore systematically - reflect on the solutions and processes - concept selection -methodology - benefits.

MODULE -II (14 hours)

PRODUCT ARCHITECTURE:

Implications - Product change - variety - component standardization - product performance - manufacturability - product development management - establishing the architecture - creation - clustering - geometric layout development - fundamental and incidental interactions - related system level design issues -secondary systems -architecture of the chunks - creating detailed interface specifications.

INDUSTRIAL DESIGN:

Integrate process design - Managing costs - Robust design - Integrating CAE, CAD,CAM tools - Simulating product performance and manufacturing processes electronically - Need for industrial design - impact - design process - investigation of for industrial design - impact - design process - investigation of customer needs -conceptualization - refinement - management of the industrial design process. Technology driven products, user driven products, assessing the quality of industrial design.

MODULE -III (10 hours)

DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT:

Definition - Estimation of Manufacturing cost - reducing the component costs and
assembly costs - Minimize system complexity - Prototype basics - principles of prototyping planning for prototypes - Economic Analysis - Understanding and representing tasks - baseline project planning - accelerating the project - project execution.

TEXT BOOK
1. Kari T.Ulrich and Steven D.Eppinger,"Product Design and Development", McGrtawHill International Edns. 1999.

REFERENCES
1. Kemnneth Crow,"Concurrent Engg./Integrated Product Development", DRM Associates, 26/3, Via Olivera, Palos Verdes, CA 90274(310) 377-569, Workshop Book.
2. Stephen Rosenthal, "Effective Product Design and Development", Business OneOrwin, Homewood, 1992, ISBN 1-55623-603-4.
3. Staurt Pugh, "Tool Design -Integrated Methods for Successful Product Engineering", Addison Wesley Publishing, New york, NY.

PEMF 5402 SURFACE ENGINEERING (3-0-0)

"Will be updated soon"

FEME 6401 HUMAN RESOURCES MANAGEMENT (3-0-0)

MODULE I

Perceptive in human resource management- Evolution of human resource management - The importance of the human factor - Objectives of human resource management - Inclusive growth and affirmative action -Role of human resource manager - Human resource policies - Computer applications in human resource management - Human resource accounting and audit.

MODULE II

Importance of Human Resource Planning - Forecasting human resource requirement - Internal and External sources. Selection process screening - Tests - Validation - Interview - Medical examination - Recruitment introduction - Importance - Practices - Socialization benefits. Training and executive development- Types of training methods purpose benefits resistance. Executive development programmes - Common practices - Benefits - Self development - Knowledge management.

MODULE III :

Sustaining employee interest - Compensation plan - Reward - Motivation - Theories of motivation - Career management - Development of mentor - Protégé relationships. Performance evaluation and control process- Method of performance evaluation - Feedback - Industry practices. Promotion, Demotion, Transfer and Separation - Implication of job change. The control process - Importance - Methods - Requirement of effective control systems grievances - Causes - Implications - Redressal methods.

Text Books

1. Decenzo and Robbins, Human Resource Management, Wiley, 8th Edition, 2007.
2. Dessler Human Resource Management, Pearson Education Limited, 2007

Reference Books

1. Mamoria C.B. and Mamoria S. Personnel Management, Himalaya Publishing Company,2007
2. Bernadin, Human Resource Management, Tata Mcgraw Hill, 6th edition 2006.
3. EugenceMckenna and Nic Beach, Human Resource Management, Pearson Education Limited, 2007.
4. Wayne Cascio, Managing Human Resource, McGraw Hill, 2007.
5. Ivancevich, Human Resource Management, McGraw Hill 2002

HSSM 3401 ENTREPRENEURSHIP DEVELOPMENT (3-0-0)

MODULE I

ENTREPRENEURSHIP - Entrepreneur - Types of Entrepreneurs - Difference between Entrepreneur and Intrapreneur - Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth. MOTIVATION - Major Motives Influencing an Entrepreneur - Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test - Stress management, Entrepreneurship Development Programs - Need, Objectives.

MODULE II

BUSINESS - Small Enterprises - Definition, Classification - Characteristics, Ownership Structures -Project Formulation - Steps involved in setting up a Business - identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment -Preparation of Preliminary Project Reports - Project Appraisal - Sources of Information -Classification of Needs and Agencies.

FINANCING AND ACCOUNTING - Need - Sources of Finance, Term Loans, Capital Structure, Financial Institution, management of working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/CPM - Taxation - Income Tax, Excise Duty - Sales Tax.

MODULE III

SUPPORT TO ENTREPRENEURS - Sickness in small Business - Concept, Magnitude, causes and consequences, Corrective Measures - Government Policy for Small Scale Enterprises - Growth
Strategies in small industry - Expansion, Diversification, Joint Venture, Merger and SubContracting.

TEXT BOOKS:

1. S.S.Khanka "Entrepreneurial Development" S.Chand& Co. Ltd. Ram Nagar NewDelhi, 1999.
2. Kuratko&Hodgetts, "Entrepreneurship - Theory, process and practices", Thomsonlearning 6th edition.

REFERENCES:
1. Hisrich R D and Peters M P, "Entrepreneurship" 5th Edition Tata McGraw-Hill, 2002.
2. Mathew J Manimala," Entrepreneurship theory at cross roads: paradigms and praxis"Dream tech 2nd edition 2006.
3. Rabindra N. Kanungo "Entrepreneurship and innovation", Sage Publications, NewDelhi, 1998.
4. EDII "Faulty and External Experts - A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development" Institute of India, Ahmadabad, 1986.

HSSM 3403 MARKETING MANAGEMENT (3-0-0)

Module -I (10 hours)

Marketing Management: Concept, Process, Functions and relevance in the current context. Marketing Environment: Elements of micro and macro environment.

Competition Analysis: Factors contributing to competition, porter's five forces model, Identifying and analyzing competitors. Marketing Planning: Exploring Opportunity, Product -market selection, Marketing Planning Process. Market Research and Information Systems: Research Process, The Internet and World Wide Web based Information collection and processing, Database, Data Warehouses and Data Mining, Global Market Research.

Consumer Behaviour: Factors   influencing   consumer   behavior,   consumer decision   process. Organizational buying behaviour.

Module II(10 hours)

Market Segmentation, Targeting and Positioning: Definition, Bases of segmenting consumer and Industrial markets. Target Market strategies: Market Positioning.

Market Demand Forecasting: Key Terms, Forecasting Tools: Short term tools: Moving average and Exponential smoothing methods, Long-term forecasting Tools: Time series analysis, Econometrics methods, Qualitative tools : Buying Intention Survey, Sales Force Opinion and Delphi Techniques. Product Planning : Product Life Cycle, New Product Development Process, Branding Strategy, Positioning a Brand, Brand Equity, Packaging and Labeling, Product-mix and Product Line, Planned Obsolescence.

Module - III(10 hours)

Pricing Decision:

Objectives and Factors influencing pricing, Pricing method and strategies. Integrated Marketing Communication (IMC)- Concept of IMC, the marketing communication process, Promotion Mix, elements of promotion mix, Direct marketing.

Channels of Distributions: Types of intermediaries, functions of distribution channels, channel levels, Designing Distribution Channels, Physical Distribution, Supply Chain Management (Basic only).

Trends in Marketing: Green Marketing, Customer Relationship Management, E-marketing, Rural Marketing and Service Marketing (concepts only)

Text Book:
1. Etzel , Walker ,Stanton and Pandit, Marketing, 14/e, Tata McGraw Hill.
2. Philip Kolter ,KoshyJha   " Marketing Management" Pearson Education Indian Adapted Edition 2007.
3. Saxena, "Marketing Management" Tata McGraw Hill, 4/e.

Reference
1. Grewal, Levy, 'Marketing' Tata McGraw Hill, special Indian edition.
2. Karunakaran "Marketing Management", Himalaya Publishing House, 2010/e.

PCMF 4404 FLEXIBLE MANUFACTURING SYSTEM & ROBOTICS (3-0-0)

MODULE -I (12 Hours)

Introduction -Types of flexibility - Components of FMS - Application workstations - Computer control and functions - Planning, scheduling and control of FMS - Scheduling - Knowledge based scheduling composition of FMS- Hierarchy of computer control-Computer control of work center and assembly lines- FMS Supervisory computer- FMS Simulation And Data base - FMS Application in machining , sheet metal fabrications- Prismatic component Production - aerospace application - FMS development to factory of Future- Artificial Intelligence & expert system in FMS.

MODULE -II (12 Hours)

Definition of Robot - Robot Anatomy - Coordinate System - Types & classifications - Pitch, yaw, roll, and joint notations - Speed of motion - pay load- Robot parts & their Functions- Different Applications ROBOT DRIVE System - Pneumatic Drive- Hydraulic Drive - Mechanical Drive- Electrical Drive Salient feature - Applications & Comparison of all these Drives. End Effectors - Grippers - Types of Grippers - Selections & Design Considerations.

MODULE- III (11 Hours)

Requirements of Sensor-Principles & applications of Sensor -types of sensors- Robot Kinematics -Homogenous Transformation Equation - Forward Kinematics - inverse kinematics - Forward & Reverse Kinematics of manipulators - lead through programming - Robot programming languages-VAL programming -Motion commands - Sensor Commands - End Effector commands & Simple program.

TEXT BOOKS:

1. Groover M.P., "Automation, Production Systems and Computer Integrated Manufacturing ", Prentice-Hall of India Pvt. Ltd., New Delhi, 1996.
2. M.P Groover ," Industrial Robotics -Technology ,Programming & applications McGraw Hill 2001.
3. Jha, N.K. "Handbook of Flexible Manufacturing Systems ", Academic Press Inc., 1991.
4. Kalpakjian, "Manufacturing Engineering and Technology ", Addison-Wesley Publishing Co., 1995.
5. TaiichiOhno, Toyota, "Production System beyond Large-Scale production ", Productivity Press (India) Pvt. Ltd., 1992.
6. R.D.Klafter , Chemieleskio, T.A.andnegin ., "Robotics Engineering an Integrated approach", Prentice Hall, 1989.

REFERENCE BOOKS:

1. G.Bekey, Autonomous Robots, MIT Press, 2005.
2. J.J.Craig, "Introduction to Robotics"Addision Wesley Publishers, 2005.

FEMT 6041 TOTAL QUALITY MANAGEMENT (3-0-0)

MODULE I
INTRODUCTION- Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs -Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership - Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.
TQM PRINCIPLES - Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement - Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement -Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership - Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures - Basic Concepts, Strategy, Performance Measure.

MODULE II
STATISTICAL PROCESS CONTROL - The seven tools of quality, Statistical Fundamentals -Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.
TQM TOOLS - Benchmarking - Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) - House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) - Concept, Improvement Needs, FMEA - Stages of FMEA.

MODULE III
QUALITY SYSTEMS - Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System - Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 - Concept, Requirements and Benefits.

TEXT BOOK
1. Dale H.Besterfiled, et al., "Total Quality Management", Pearson Education, Inc. 2003.(Indian reprint 2004).ISBN 81-297-0260-6.

REFERENCE BOOKS
2. James R.Evans& William M.Lidsay, "The Management and Control of Quality", (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
3. Feigenbaum.A.V. "Total Quality Management", McGraw-Hill, 1991.
4. Oakland.J.S. "Total Quality Management", Butterworth Hcinemann Ltd., Oxford, 1989.
5. Narayana V. and Sreenivasan, N.S. "Quality Management - Concepts and Tasks", New Age International 1996.
6. Zeiri. "Total Quality Management for Engineers", Wood Head Publishers, 1991.

PEMF 5405 STATISTICAL METHODS & DESIGN OF EXPERIMENTS

(3-0-0)

MODULE -I (13 hours)

RANDOM VARIABLES Discrete and Continuous random variables - Moments - Moment generating functions -Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

TWO-DIMENSIONAL RANDOM VARIABLES :Joint distributions - Marginal and Conditional distributions - Covariance - Correlation and Linear regression - Transformation of random variables - Central limit theorem (for independent and identically distributed random variables).

MODULE -II (12hours)

TESTING OF HYPOTHESIS :Sampling distributions - Tests for single mean, proportion, Difference of means (large and small samples) - Tests for single variance and equality of variances - χ^2-test for goodness of fit - Independence of attributes - Non-parametric tests: Test for Randomness and Ranksum test (Wilcoxon test).

MODULE-III (10 hours)

DESIGN OF EXPERIMENTS: Completely randomized design - Randomized block design - Latin square design - 22 -factorial design- Test of Significance and Model lack of fit

TEXT BOOKS

1. Milton, J. S. and Arnold, J.C., "Introduction to Probability and Statistics", TataMcGraw Hill, 4th edition, (2007).
2. Johnson, R.A. and Gupta, C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, (2007).

PEMF 5406 COMPUTER INTEGRATED MANUFACTURING (3-0-0)

MODULE -I (12 hours)

PRODUCTION PLANNING AND CONTROL :Basic concepts - Types of production System - Functions of production planning and control - problems with Production Planning and Control - Computer Integrated Production Management System- Forecasting - Purpose and methods of forecasting - Single and Double Moving average methods - Single and Double exponential smoothing methods - Simple regression method of forecasting - errors in forecasting.

MODULE -II (11 hours)

MATERIAL REQUIREMENT PLANNING: Basic MRP Concepts - Inputs to the MRP System - Master production Schedule - Bill of Materials, Inventory Record File - MRP Logic - Gross requirements, net requirements, lot sizing - MRP reports - Capacity Planning - Benefits of MRP Manufacturing Resource Planning (MRP II). SHOP FLOOR CONTROL: Functions of shop floor control - order scheduling - order progress - Data logging and acquisition - Automated data collection - Control types - Sensor Technology.

MODULE -III (12 hours)

COMPUTER AIDED PROCESS PLANNING :Need for process planning - Functions of process planning - Future trend of CAPP - Expert process planning system - case studies.-Variant process planning - part family search - Generative method of CAPP - Forward and Backward planning - input format - part description methods - CAD Models - Decision Logic - Artificial Intelligence - Knowledge Representation - Databases and Algorithms - Automatic Process Planning - Programming Practice using C, C++ for Computer Integrated Production Management System Applications.

TEXT BOOKS
1. MikellP.Groover, "Automation, Production Systems and Computer Integrated Manufacturing", Prentice Hall of India, 2004.
2. S.Kant Vajpayee, Principles of Computer Integrated Manufacturing, Prentice Hall of India, 2006.

REFERENCES
1. MikellP.Groover M.P., Emory W. Zimmers, "CAD/CAM, Computer Aided Design and Manufacturing", Prentice Hall of India, 2006.
2. Gideonha and Roland D.Well, "Principles of process planning", Chapman and Hall,1995.
3. T.C.Chand, "Expert process planning for manufacturing", Addison Wesley publishing company, 1990

PEMF 5304 PRECISION ENGINEERING (3-0-0)

"Will be uploaded soon"

FEMF 6401 SUPPLY CHAIN MANAGEMENT (3-0-0)

MODULE I :
SCM : Changing Business Environment , Need ,Conceptual Model of Supply Chain Management ;Evolution - Traditional and Modern Approach Elements in SCM , Demand management in supply chain: Demand Planning and Forecasting, Demand Forecasting methods, Characteristics Measures of Forecast Error , Customer Order Decoupling Point (CODP) . Industries: Classification Based on Nature of Work , Volume , Manufacturing Environment ,Need for Strategy SCM in The Market: A Paradigm Shift - Collaboration Strategy' , Demand Flow Strategy , Customer Service Strategy , Technology integration Strategy . CPFR(Collaborative Planning Forecasting Replenishment) : Concept and shift to CPFR , Issues and Facts in Collaboration , Connect Interact, integrate, and Collaborate , CPFR Implementations, Profile of a Collaborative Company.

MODULE II :
Operations Management In Supply Chain : Introduction: Manufacturing System - Mass, Lean, Agile, Quick Response Manufacturing. Lean Manufacturing - Evolution, Toyota Production System, Basic Idea and Framework, Continuous Flow, Standardized Work, Value Stream, Value added Activities, Pull Production, Integration of Lean Manufacturing and SCM. Mass Customization: Meaning, Evolution, Drivers of Mass Customization: Technology and Globalization, Characteristics, Approaches, Methods and Levels of Customization, Information Cycle in mass customization, Benefits and Limitations, Supply Chain Management for Mass Customization. Procurement Management In Supply Chain : Introduction, Purchasing Cycle, Type and classification of Purchases , Inventory Models ,Economic Order Quantity , Practicalities, Safety Stock ,Fixed Order interval System and Fixed Order Quantity System . Material Requirements Planning (MRP) ,and Just in Time (JIT) Vendor Managed Inventory(VMI) - VMI Business Model , Challenges and Limitations of VMI ,Just in Time (JIT)-II ,Multi-tier Supplier Partnership.

MODULE III:
Logistics Management Introduction, Evolution of Logistics Elements of Logistics Management. Customer Order Processing, Location Analysis, Inventory Control, Material Handling, Packaging, Transportation, Warehousing,Customer Service Distribution Management. Transportation Management: Distribution Strategies - Cross Docking, Milk Runs, Direct Shipping, Hub and Spoke Model, Pool Distribution. Packaging for Logistics: Concept, Requirements, Trends of Packaging, Functionality ,Participants ,Transportation Formats, Private Fleet , Modes of transportation , Decision Factors, Transport Documentation .Service innovation, Inter-modal Transportation Mode, Containerization ,RFID Third-Party Logistics (TPL/3PL) , Operations of Indian 3PLs Fourth-Party Logistics (4PL)- Key Components including GPS and *G*IS Technology. Technology Component of 4PL .GPS and *G*IS Technology, Performance Measurement And Controls Benchmarking: Introduction and Concept Forms, Gap Analysis.

TEXT BOOKS:
1. Supply Chain Management : Sunil Chopra , Peter Meindl ,D V Kalra ,Pearson Prentice Hall , 2007
2. Supply Chain Management: A.S.Altekar PHI Second Ed.2006
3. Logistics Management: James Stock and Douglas Lambert. McGraw Hill International Ed.2006

REFERENCE BOOKS:
1. Supply Chain Management for Global Competitiveness: Ed.B.S.Sahay McMillan Publication 2000
2. Emerging Trends in Supply Chain Management: Ed.B.S.Sahay McMillan Publication 2000. Logistics Management: Bowersox TMH 2004

PETX 5412 MANAGEMENT INFORMATION SYSTEM (3-0-0)

Module - I (12 hours)

Overview: Definition of MIS, Data processing and MIS, Characteristics of MIS, Need / importance of MIS in organization, Limitations of MIS; MIS and other disciplines

Data and Information; Characteristics of Information; Types of Information - Operational, Tactical and Strategic information; Managers as Information Processors;

System Approach: MIS as a system, Sub-systems of MIS - Activity sub-systems, Functional sub-system

Decision Making: Decision-making under certainty, risk and uncertainty; Phases of Decision-making Process; Decision Models - Classical Economic Model, Administrative Model; Organizational Decision-making Planning for development of MIS: Feasibility Analysis - Technical, Economic, Motivational, Schedule and Operational Feasibility; MIS development as a project;

Module - II (12 hours)

Overview of System Life Cycle Models - Waterfall model, Prototyping model and Spiral model System Analysis and Design (SAD): Purpose, Requirement engineering, Typical content of System Requirement Specification (SRS), System Design - high level design and low level design, Characteristics of good design - coupling and cohesion

Overview of tools used in SAD - Context diagram, Data Flow Diagram (DFD), Data Dictionary, ER diagram, Structure charts, HIPO documentation, Decision Table, Decision Tree, Pseudo code.

Module - III (12 hours)

MIS in Organization: MIS in Marketing; Manufacturing; HRM; Accounting and Finance, Enterprise Resource Planning (ERP) System. Business Intelligence (BI): Role of BI in marketing, finance, human resource, and manufacturing; Overview of DSS, Data Mining and Data Warehouse Implementation of MIS: Critical Success Factor Information System Security, Privacy, Social and Ethical issues

Books:
1. Management Information Systems, M Jaiswal& M Mital, Oxford Univ. Press
2. Information Systems for Modern Management, Murdick, Ross &Claggett, PHI
3. Management Information System, Launden&Launden, Pearson
4. Management Information System, James O Brian, TMH
5. Management Information Systems, A K Gupta, Sultan Chand & Sons
6. Management Information System, Jawadekar, McGraw Hill

PEEE 5406 SOFT COMPUTING (3-0-0)

MODULE-I (12 Lectures) Introduction: Soft Computing Constituents and Conventional Artificial Intelligence, Neuro-Fuzzy and Soft Computing Characteristics. Fuzzy Sets: Introduction, Basic Definitions and Terminology, Set Theoretic Operations, MF Formulation and Parameterization. Fuzzy Rules & Fuzzy Reasoning: Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning. Fuzzy Inference Systems: Mamdani Fuzzy Models, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models, Other Considerations. (BOOK-1:- Chap-1: 1.1 to 1.3, Chap-2: 2.1 to 2.4, Chap-3: 3.2 to 3.4 & Chap-4: 4.2 to 4.5)

MODULE-II (14 Lectures)   Neural Networks: Neuron Abstraction, Neuron Signal Functions, Mathematical Preliminaries, Neural Networks Defined, Architectures: Feed forward and Feedback, Salient Properties and Application Domains of Neural Networks, Multi-layered Network Architectures, Back-propagation Learning Algorithm, Practical Considerations in Implementing the BP Algorithm, Structure Growing Algorithms, Universal Function Approximation and Neural Networks, Applications of Feed Forward Neural Networks, Reinforcement Learning, Radial Basis Function Networks, Regularization Theory Route to RBFNs, Generalized Radial Basis Function Network, Learning in RBFNs, Associative Learning, Hopfield Network, Content Addressable Memory, Bidirectional Associative Memory, Self Organizing Feature Maps, Applications of the Self Organizing Map. (BOOK-2:-Chap-3: 3.1 to 3.6, Chap-6: 6.1 to 6.2, 6.5 to 6.6 & 6.8 to 6.10, Chap-8: 8.4 to 8.7, Chap-10: 10.2 & 10.5 to 10.6 & 10.16 and Chap-12: 12.8 to 12.9)

MODULE-III (08 Lectures) Regression & Optimization: System Identification: an Introduction, Least Squares Estimator, Geometric Interpretation of LSE, Recursive Least Squares Estimator. Derivative-Free Optimization: Genetic Algorithms, Simulated Annealing, random Search, Downhill Simplex Search.   Adaptive Neuro-Fuzzy Inference Systems (ANFIS): ANFIS Architecture, Hybrid Learning Algorithm. (BOOK-1:- Chap-5: 5.1, 5.3 to 5.5, Chap-7: 7.2 to 7.5 and Chap-12: 12.2 to 12.3)

TEXT BOOK:
1. "Neuro-Fuzzy and Soft Computing" By J.-S.R.Jang, C.-T.Sun & E. Mizutani, PHI
2. "Neural Networks: A Classroom Approach" By Satish Kumar, TMH Education

Reference Book:
1. "Neural Networks Fuzzy Logic & Genetic Algorithms; Synthesis & Applications, S.Rajasekaran & G.A. VijayaLaxmi Pai, Prentice Hall, India, May'2006- LakshmiPai
2. Principle of Soft Computing, S.N. Sivanandan & S.N. Deepa, Wiley India Edition,2010.