COCHIN UNIVERSITY OF SCIENCE & TECHNOLOGY

Scheme for I to VIII

B.TECH MECHANICAL ENGINEERING

(2006 Admission onwards)

B.TECH MECHANICAL ENGINEERING

NB: ***For all practicals from semester I & II to semester VII, 50% weightage is to be given for continuous evaluation and 50% for end semester examination***

Semester I & II (Common to all branches)

Course Code	Subject Name	Hrs./ week		Marks		
		L	T/D/P	Internal	University	Total
CE/CS/EB/EC/EE/ EI/IT/ME/SE **101**	Engineering Mathematics I	3		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **102**	Engineering Physics	2		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **103**	Engineering Chemistry	2		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **104**	Engineering Mechanics	3	1	50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **105**	Engineering Graphics	1	3	50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **106**	Basic Civil & Mechanical Engineering	2		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **107**	Basic Electrical Engineering & Electronics	2		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **108**	Computer Programming	2		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **109**	Technical Communication & Social Sciences	3*		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **110**	Computer Programming Lab		3	50	50	100
CE/CS/EB/EC/EE/ EI/IT/ME/SE **111**	Electrical & Mechanical Workshops		3	50	50	100
	Total	**20**	**10**	**550**	**1000**	**1550**

*** 1 hour/week for environmental studies**

Semester III

Course Code	Subject Name	Hrs./week		Marks		
		L	T/D/P	Internal	University	Total
CE/CS/EB/EC/EE/ EI/IT/ME/SE **301**	Engineering Mathematics II	4		50	100	150
EB/EC/EI/IT/ ME **302**	Electrical Technology	4		50	100	150
ME **303**	Mechanics of Solids	4		50	100	150
ME **304**	Fluid Mechanics	4		50	100	150
ME **305**	Metallurgy & Mat. Science	4		50	100	150
ME **306**	Machine Drawing	1	3	50	100	150
ME **307**	Strength of Materials Lab		3	50	50	100
ME **308**	Fluid Mechanics Lab		3	50	50	100
	Total	**21**	**9**	**400**	**700**	**1100**

Semester IV

Course Code	Subject Name	Hrs./week		Marks		
		L	T/D/P	Internal	University	Total
CE/CS/EB/EC/EE/EI/ IT/ME/SE **401**	Engineering Mathematics III	4		50	100	150
ME **402**	Industrial Electronics	4		50	100	150
ME **403**	Advanced Mechanics of Solids	4		50	100	150
ME **404**	Applied Thermodynamics	4		50	100	150
ME **405**	Hydraulic Machinery	4		50	100	150
ME **406**	Manufacturing Process	4		50	100	150
ME **407**	Electrical Lab		3	50	50	100
ME **408**	Computational Lab		3	50	50	100
	Total	**24**	**6**	**400**	**700**	**1100**

Semester V

Course Code	Subject Name	Hrs/week		Marks		
		L	T/D/P	Internal	University	Total
CE/CS/EB/EC/EE/EI/ IT/ME/SE **501**	Engineering Mathematics IV	4		50	100	150
ME **502**	Metrology & Machine Tools	4		50	100	150
ME **503**	Mechanics of Machinery	4		50	100	150
ME **504**	Thermal Engineering	4		50	100	150
ME **505**	Power Plant Engineering	4		50	100	150
ME **506**	Industrial Management	4		50	100	150
ME **507**	Hydraulic Machinery Lab		3	50	50	100
ME **508**	Machine Shop		3	50	50	100
	Total	**24**	**6**	**400**	**700**	**1100**

Semester VI

Course Code	Subject Name	Hrs./week		Marks		
		L	T/D/P	Internal	University	Total
ME **601**	Instrumentation & Control Systems	4		50	100	150
ME **602**	Dynamics of machinery	4		50	100	150
ME **603**	Machine Design I	4		50	100	150
ME **604**	Heat & Mass transfer	4		50	100	150
ME **605**	Tool Engineering & Design	4		50	100	150
ME **606**	CAD-CAM	4		50	100	150
ME **607**	Thermal Engineering. Lab		3	50	50	100
ME **608**	Metrology & Measurements Lab		3	50	50	100
	Total	**24**	**6**	**400**	**700**	**1100**

Semester VII

Course Code	Subject Name	Hrs./week		Marks		
		L	T/D/P	Internal	University	Total
ME **701**	Operations research	4		50	100	150
ME **702**	Vibration & Noise Control	4		50	100	150
ME **703**	Machine Design II	4		50	100	150
ME **704**	Refrigeration & Air-conditioning	4		50	100	150
ME **705**	Elective I	4		50	100	150
ME **706**	HMT Lab		3	50	50	100
ME **707**	CAD-CAM Lab		3	50	50	100
ME **708**	Seminar		2	50		50
ME **709**	Project Design		2	50		50
	Total	**20**	**10**	**450**	**600**	**1050**

ELECTIVE I

ME 705 A: Aerospace Engineering
ME 705 B: Finite Element Method
ME 705 C: Advanced Engineering Materials
ME 705 D: Quality Engineering

Semester VIII

Course Code	Subject Name	Hrs./week		Marks		
		L	T/D/P	Internal	University	Total
ME 801	Operations Management	5		50	100	150
ME 802	Compressible Fluid Flow	5		50	100	150
ME 803	Production Technology	5		50	100	150
ME 804	Elective II	5		50	100	150
ME 805	Project		10	300		300
ME 806	Viva voce				100	100
	Total	**20**	**10**	**500**	**500**	**1000**
	Grand Total			**3700**	**4300**	**8000**

ELECTIVE II

ME 804 A Propulsion Engineering
ME 804 B: Computational Fluid Dynamics
ME804 C: Material Management
ME 804D: Advanced Production Technology
ME 804 E: Automobile Engineering

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

Note: 50% Marks is earmarked for continuous evaluation and 50% marks for end semester examination to be assessed by two examiners. A candidate shall secure a minimum of 50% marks separately for the two components to be eligible for a pass in that subject.

CE/CS/EB/EC/EE/EI/IT/ME/SE 101 ENGINEERING MATHEMATICS I

MODULE I

Ordinary differential equations:

First order differential equations-Methods of solution and Simple applications-
Linear differential equations of higher orders with constant co-efficients-Methods of solution of these equations. Cauchy's Linear differential equations. Simultaneous linear differential equations- Simple applications of linear differential equations in engineering problems –Electrical Circuits, Mechanical Systems

MODULE II

Infinite series : Integral test, comparison test, ratio test, Cauchy's root test, Raabe's test, seies of positive and negative terms, concept of absolute convergence, alternating series, Leibniz test(No proofs for any of the above tests)

Power series : Internal of convergence of power series, Taylor and Maclaurin series of functions, Leibniz formula for the nth derivative of the product of two functions (No proof),use of Leibniz formula for the determination of co-efficients of the power series.

MODULE III

Partial differentiation: Partial differentiation-Concept of partial derivative - Chain rule- Total derivative- Euler's theorem for homogeneous functions, Differentials and their applications in errors and approximations, Jacobians - Maxima minima of functions of two variables(Proof of the result not required)-Simple applications.
Taylors series expansion for a function on two variables-Simple problems

Co-ordinate systems: Rectangular co-ordinates-Polar co-ordinates-In plane and in Space-Cylindrical polar co-ordinates-Spherical polar co-ordinates.

MODULE IV

Integral calculas:

Application of definite integrals: Area, Volume, Arc length, Surface area.
Improper Integrals-Beta function-Gamma function
Multiple integrals : Evaluation of double integrals-Change of order of integration. Evaluation of triple integrals-Change of Variables in integrals.
Applications of multiple integrals Plane Area, Surface area &Volumes of solids

TEXT BOOKS:

Engineering mathematics -Vol1:S.S.Sastry, PHI publishers
Advanced Engineering Mathematics: Erwin Kreyzig,
Wiley Eastern

REFERENCES:

Mathematical Techniques: Oxford University Press
Engineering Mathematics: T.Veerarajan, TMGH Publishers
Higher Engineering Mathematics: B.S.Grewal, Khanna Publishers

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

CE/CS/EB/EC/EE/EI/ME/IT/SE 102: ENGINEERING PHYSICS

Module I:

Interference of light – Michelson interferometer – Applications-Interference in thin films – Antireflection coatings – Interference filters – Fringes produced by air wedge – Testing of flat surfaces- Diffraction of light –Zone plate - Plane diffraction grating - Reflection and transmission gratings – Determination of wavelength of light – Dispersive and resolving powers - Polarization of light – Double refraction – Nicol's prism – Quarter and half wave plates – Elliptically and circularly polarized light – Optical activity – Specific rotation – Half-shade polarimeter – Applications of polarized light.

Module II:

Lasers and Holography – Properties of laser light – Coherence of light – Principles of laser action – Population inversion – Optical pumping – Metastable states – Conditions for laser action – Types of lasers – Helium-Neon, Ruby and Semiconductor lasers – Applications of lasers – Principles of holography – Recording and Reconstruction of holograms – Applications of holography- Fiber optics – Light transmission through optical fiber – Numerical aperture – Multi and single mode fibers – Step index and graded index fibers – Fiber drawing – Fiber optic communication (basic ideas) – Ultrasonics – Generation of ultrasonic waves – Applications of Ultrasound.

Module III:

Quantum mechanics – Heisenberg's uncertainty principle - Experimental illustrations – Quantum mechanical wave equation – Time independent Schrodinger equation – Physical significance of wave function – Properties of the wave function – Solution of Schrodinger equation - Atomic and nuclear physics – The Vector atom model – Quantization of orbital angular momentum – Electron spin - Magnetic moment of orbital electron – Pauli's exclusion principle– Zeeman effect – Stark effect – Raman effect. Nuclear physics – Nuclear forces – Properties of the nucleus - Nuclear reactions-Nuclear reaction cross section-Artificial radioactivity – Nuclear reactors – Nuclear fusion – Thermonuclear reactions-Controlled thermonuclear reactions.

Module IV:

X-rays – Production of X-rays – Origin of X-rays and X-ray spectra – Moseley's law – Properties of X-rays – Applications of X-rays – Diffraction of X-rays by crystals – Bragg's law – Crystallography – Unit cell – Seven crystal systems – Bravais space lattices - Packing factor – Lattice planes and Miller indices – Energy bands in solids – Conductors, semiconductors and insulators – Intrinsic and extrinsic semiconductors – Conductivity of semiconductors – Fermi level - Applications of semiconductors – p-n junctions – solar cells – Hall effect and its

applications – Superconductivity – Superconducting transition – The Meissner effect – Type I and Type II superconductors – Isotope effect - High temperature superconductors – Josephson effect – SQUIDS – Applications of superconductors

Text and Reference Books :

1. *Jacob Philip – A text book of Engineering Physics, Educational Publishers and Distributors 2002*
2. *A.S. Vasudeva – Modern Engineering Physics, S. Chand & Co.*
3. *M.R. Sreenivasan – Physics for Engineers – New Age International*

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

CE/ CS/EB/EC/EE/EI/ME/IT/SE 103 ENGINEERING CHEMISTRY

Module I
Solid state chemistry: Fundamentals, Bonding in solids, Born-Haber cycle, Point defects, Methods to improve reactivity of solids, Free electron theory, Band theory, Fermi level in semiconductors, Molecular field theory of magnetic materials, Conventional and organic superconductors, High temperature superconductors, Liquid crystals, Applications. Solid surface characterisation: Electron spectroscopy for chemical analysis, Chemical shift, BET isotherm, Thermodynamics of adsorption.

Module II
Electrochemistry: Fundamentals, Electrode potentials, Types of electrodes, Salt bridge, emf measurement, Concentration cells, Acids and bases, Buffer solutions, pH measurements, Polarisation, Overvoltage. Power generation: Secondary cells, Fuel cells, Photovoltaic effect, Solar cells. Corrosion: Different forms of corrosion, Prevention of corrosion.
Chemical Kinetics: reaction rate, rate constant, rate law, reaction order, first order, second order, pseudo-first order reactions, integrated rate laws, half-life of a reaction and its relation to rate constant. Molecularity, simple unimolecular and bimolecular reactions. Arrhenius equation. Fast reactions – flash photolysis, flow techniques and relaxation methods.

Module III
Chemical Thermodynamics: Fundamentals, Molecular interpretation of internal energy, enthalpy and entropy, Heat of reaction, Kirchhof.s equation, Trouton.s rule, Entropy changes accompanying different processes, Nernst heat theorem, Third-law. Free energy: Dependence on pressure and temperature, Gibbs-Helmholtz equation, Free energy changes and equilibrium constant, Chemical potential, Fugacity, Thermodynamics of biochemical reactions.

Module IV
Engineering materials: Industrial polymers-polymerization techniques, structure-property relationships, polymer additives, polymer processing methods (extrusion, injection, compression, transfer and blow molding methods). Nanomaterials: definition, classification and applications. Nanometals and nanoceramics – examples and properties.
Lubricants: classification, functions and properties. Mechanism of lubrication.
Refractories: classification and properties. Portland cement, lime and plaster of Paris – manufacture, setting and hardening.
Chemistry of optical fibres, fullerenes and organoelectronic materials (introduction only).

TEXT BOOKS

1. Peter Atkins and Julio de Paula — *Elements of Physical Chemistry*, Oxford University Press, 2005
2. Shashi Chawla — *A Text Book of Engineering Chemistry* (3rd edn.).; Dhanpat Rai & Co, New Delhi, 2003.

REFERENCES

1. Atkins, P.W., *Physical Chemistry*, Oxford University Press, UK, 1998
2. Bhatnagar, M. S., *Textbook of Pure & Applied Physical Chemistry*, A. H. Wheeler & Co, New Delhi, 1999.
3. Geoffrey Ozin, Andre Arsenault *Nanochemistry: A Chemical Approach to Nanomaterials*.; Royal Society of Chemistry, U.K. 2005.

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

CE/CS/EB/EC/EE/EI/IT/ME/SE 104 ENGINEERING MECHANICS

A) STATICS

MODULE I

Concurrent forces in a plane: Principles of statics. Composition and resolution of forces. Equilibrium of concurrent forces in a plane. Method of projection. Method of moments. Friction.

Parallel forces in a plane: Two parallel forces. General case of parallel forces in a plane. Centre of parallel forces and centre of gravity, Pappus theorems, centroids of composite plane figures and curves. Distributed forces in a plane.

MODULE II

Properties of areas: . Moment of inertia of a plane figure with respect to an axis in its plane. Polar moment of inertia. Product of inertia. Principal axes. Mass moment of inertia of material bodies.

General case of forces in a plane: Composition of forces in a plane. Equilibrium of forces in a plane. Plane trusses - Method of joints. Method of sections. Plane frames : Method of members.

Principle of virtual work: Equilibrium of ideal systems, stable and unstable equilibrium.

B) DYNAMICS

MODULE III

Rectilinear translation: Kinematics of rectilinear motion. Differential equation of rectilinear motion. Motion of a particle acted upon by a constant force, by a force as a function of time and by a force proportional to displacement. Simple harmonic motion. D'Alembert's principle. Momentum and impulse. Work and energy, ideal systems, conservation of energy. Impact.

MODULE IV

Curvilinear translation: Kinematics of curvilinear translation. Differential equations of motion. Motion of a projectile. D'Alembert's principle in curvilinear motion. Moment of momentum. Work and energy in curvilinear motion.

Rotation of a rigid body: Kinematics of rotation. Equation of motion of a rigid body rotating about a fixed axis. Rotation under the action of a constant moment. Compound pendulum. General case of moment proportional to the angle of rotation. D'Alemberts principle of rotation. Resultant inertia force in rotation. Principle of angular momentum in rotation. Energy equation for rotating bodies.

TEXT BOOK & REFERENCES :

1. Engineering Mechanics - Timoshenko and Young - McGraw Hill Book Company.
2. Mechanics for Engineers (Vol. 1- Statics and Vol.2 -Dynamics) - Beer F. P. & Johnston E. R. - Tata McGraw Hill.

3.Engineering Mechanics (Vol. 1- Statics and Vol.2 -Dynamics) - Merriam H. L. & Kraige L. G. - John Wiley and Sons.

4.Engineering mechanics- Biju N- Educational Publishers.

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

CE/CS/EB/EC/EE/EI/IT/ME/SE 105 ENGINEERING GRAPHICS

MODULE I

Introduction to engineering graphics. Drawing instruments and their use. familiarisation with current Indian Standard Code of Practice for general engineering drawing.
Scales- plain scale ,vernier scale, diagonal scale.
Conic sections- Construction of ellipse, parabola, hyperbola - construction of cycloid, involute, archimedian spiral and logarithmic spiral- drawing tangents and normals to these curves.

MODULE II

Introduction to orthographic projections- plane of projection- principles of first angle and third angle projections, projection of points in different quadrants.
Orthographic projection of straight lines parallel to one plane and inclined to the other plane- straight lines inclined to both the planes- true length and inclination of lines with reference planes- traces of lines.
Projection of plane laminae of geometrical shapes in oblique positions.

MODULE III

Projection of polyhedra and solids of revolution- frustum, projection of solids with axis parallel to one plane and parallel or perpendicular to other plane- projection of solids with axis inclined to both the planes- projection of solids on auxiliary planes.
Section of solids by planes inclined to horizontal or vertical planes- true shape of sections.

MODULE IV

Development of surface of cubes, prisms, cylinders, pyramids and cones
Intersection of surfaces- methods of determining lines of intersection - intersection of prism in prism and cylinder in cylinder.

MODULE V

Introduction to isometric projection- isometric scales, isometric views- isometric projections of prisms, pyramids, cylinders, cones and spheres.
Introduction to perspective projections : visual ray method and vanishing point method- perspective of circles- perspective views of prisms and pyramids.

TEXT BOOKS & REFERENCES:

1. Engineering Graphics	P.I.Varghese & K.C. John, JET Publishers
2. Elementary engineering drawing	N.D.Bhat, Charotar publishing house
3. Geometric drawing,	P.S.Gill , B.D Kataria &sons Ludhiana
4. Engineering Graphics	P I Varghese, VIP Publishers.

University Examination Pattern

Answer 5 Questions choosing one from each module-20 marks each

CE/CS/EB/EC/EE/EI/IT/ME/SE 106 BASIC CIVIL AND MECHANICAL ENGINEERING

(A) CIVIL ENGINEERING

MODULE I

Materials: *Cement* - varieties and grade of cement and its uses. *Steel*- types of steel for reinforcement bars, steel structural sections. *Brick*- varieties and strength , tests on bricks. *Aggregates*- types & requirements of good aggregates. *Concrete*- grades of concrete as per IS code, water cement ratio, workability, mixing, batching, placing, compaction and curing.
Construction : *Foundation*- types of foundations- isolated footing, combined footing, raft, pile & well foundations,

MODULE II

Super structure : Brick masonry, English bond and Flemish bond , Stone masonry, Random rubble masonry. *Roofing*- Steel trusses, roofing for industrial buildings
Surveying: Principles, instruments, ranging and chaining of survey lines, errors in chaining, field work, field book, selection of survey stations, reconnaissance ,,
Levelling : Levelling instruments, different types, temporary adjustments, mean sea level, reduced level of point, booking of field notes, reduction of levels by height of collimation method.

Text Books & References :

1. Engineering materials : Rangawala
2. Building construction : Punmia
3. A Text book of building construction : N.K.R. Murthy
4. Fundamentals of Civil Engineering- : Roy M Thomas-Educational Publishers.
5. A Text book of building construction : Jha & Sinha
6. Surveying & Levelling : T P Kanetkar
7. Surveying & Levelling : Hussain

(B) MECHANICAL ENGINEERING

MODULE III

Thermodynamics: thermodynamic systems - open, closed and isolated systems, equilibrium state. of a system, property' and state, process, cycle, work, Zeroth law of thermodynamics-concept of temperature, temperature scales. First law - internal energy, enthalpy. Second law - Kelvin-Plank and Claussius statements, Carnot Cycle.

Refrigeration and Air conditioning: Vapour compression and vapour absorption refrigeration systems, summer and winter Air conditioning, Comfort and industrial Air conditioning.

Elementary ideas of simple reaction and impulse turbines, compounding of turbines.

MODULE IV

Internal Combustion Engines: working of two stroke and four stroke Petrol and Diesel engines, simple Carburettor, ignition system, fuel pump, fuel injector, cooling system, lubricating system.
Transmission of Power: Belt drives (open and closed), chain drives.
Metal fabrication: Welding - Arc, gas, resistance welding, Welding defects, Soldering, Brazing

Text Books & References:

1. Engineering Thermodynamics	P.K.Nag
2. Engineering Thermodynamics	D.B. Spalding & E.H.Cole
3. Engineering Thermodynamics	Van Wylon
5. Thermodynamics	J.P.Holman
6. Elements of Internal Combustion Engines	Rogowsky, Tata McGraw Hill
7. Fundamentals of Internal Combustion Engines	Gill, Smith & Ziurys, Oxford & IBH
8. Refrigeration and Air Conditioning,	Stoecker Tata McGraw Hill

Type of questions for University Examination

PartA -

Question 1- 4 short answer questions of 5 marks each. 2 questions from each module
Question 2-3 – There will be two choices from each module .Answer one question from each module of 15 marks
<u>Part B</u>
Question 4-4 short answer questions of 5 marks each. 2 questions from each module
Question 5-6 – There will be two choices from each module .Answer one question from each module of 15 marks

CE/CS/EB/EC/EE/ EI/IT/ME/SE 107 BASIC ELECTRICAL ENGINEERING& ELECTRONICS

(A) ELECTRICAL ENGINEERING

Module I

Basic principles of Electric circuits: Review of Ohms law - Definition of resistance, current, voltage and power - Series and parallel circuits- constant voltage source and constant current source.

Network Theorems: Kirchoff's laws- Network analysis by Maxwell's circulation currents - Thevenin's theorem - Superposition theorem -Norton's theorem - Simple illustrative problems on network theorems.

Review of electrostatics - Coulomb's Law- Electric field strength and Electric flux density- capacitance.

Module II

Review of electromagnetic induction -Faraday's Law- Lenz's Law - mutually induced emf. Magnetic circuits - magnetic field of a coil - Ampere turns calculation - magnetic flux - flux density - field strength.

Measuring instruments: Working principle of galvanometer, Ammeter, Voltmeter, watt meter & energy meter.

AC fundamentals: Generation of alternating voltage and current - equations of sinusoidal voltage and current - wave form, cycle frequency, time period, amplitude, phase difference, rms value, average value, power factor & form factor. Vector diagram - addition and subtraction of vectors- sine waves in phase and out of phase. AC circuits: RC, RL, RLC circuits-series and parallel - current, voltage and power relationships. Poly phase circuits: vector representation - phase sequence - star and delta connections.

TEXT BOOK

1. Basic Electronics – Solid State – B. L. Theraja, S. Chand & Co.
2. Fundamentals of Electrical Engineering – Leonard S. Bobrow, Oxford University Press.

REFERENCES

1. Electrical Technology : Edward Hughes, Addison Wesley Publication
2. Electronic Devices & Circuits : G.K. Mithal & Ravi Mittal, Khanna Publishers

(B) ELECTRONICS

Module III

Passive components: Resistor – Capacitor - Inductor - Color coding. Transformer- different types, construction.

Semiconductors: Energy band diagram – intrinsic & extrinsic semi conductors, doping - PN junction – Diodes, Zener diodes- Characteristics - Application of diodes. Rectifiers- Half wave, full wave and Bridge rectifiers – Ripple factor and regulation.

Transistors: - PNP and NPN transistors - theory of operation - Transistor configurations - characteristics - comparison.

Special semiconductor devices - FET - SCR - LED - LCD – V-I characteristics, applications.

Module IV

Fundamentals of Instrumentation: Transducers - Definition - Classification – Active & passive - Transducer for position, pressure, velocity, vibration and temperature measurements.
CRO – principle of operation - measurement of amplitude, frequency and phase.
Fundamentals of Communication: Analog communication - concept of modulation, demodulation. Types: AM - FM -PM- Block diagram of general communication system -Basic concepts of digital communication - Block diagram.

TEXT BOOK

3. Basic Electronics – Solid State – B. L. Theraja, S. Chand & Co.
4. Fundamentals of Electrical Engineering – Leonard S. Bobrow, Oxford University Press.

REFERENCES

3. Electrical Technology : Edward Hughes, Addison Wesley Publication
4. Electronic Devices & Circuits : G.K. Mithal & Ravi Mittal, Khanna Publishers

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

CE/CS/EB/EC/EE/E1/IT/ME/SE 108 COMPUTER PROGRAMMING

Module 1

Introduction to programming in C: Fundamental data types- integer, floating point, and enumerated data types, typedef Expressions – arithmetic, relational and logic operators, Type conversion – simple and compound statement, Access to standard library, standard I/O-getchar, putchar, Formatted **I/O**, scanf, printf, error handling, line input and out put, control structures, selection statement, **IF, SWITCH, WHILE, DO WHILE, FOR, BREAK, CONTINUE, GOTO, RETURN** statements.

Module 2

Functions: Declarations and functions, parameter passing mechanism, storage classes-scope, visibility, and life time of variables, AUTO, EXTERN, STATIC and REGISTER modifiers, Recursion.

Module 3

Arrays : Single and multi dimensional arrays, sorting, selection sort, search-linear search and binary search, Structures and union.

Module 4

Pointers: Pointers and addresses, pointer arrays, function returning pointers, pointers to function, pointer arithmetic,. pointers to structures, array of structures, preprocessor directive, command line arguments

Text Book

1. Mullish & Cooper The Spirit of C An introduction to Modern programming Jaico Publication 1988
2. B.S. Gotfried (Schaum series, TMH)- Programming in C, *

References:

1. Pradeep Dey and Manas Ghosh,"Computer Fundamentals and Programming in C", Oxford 2006
2. Varghese Paul- Computer Fundamentals,* EPD,Kochi
3. Brian W. Kernighan and Dennis M.Richie,"The C Programming Language" PHI,2nd ed.,

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

CE/CS/EB/EC/EE/EI/ /IT/ ME /SE 109
TECHNICAL COMMUNICATION AND SOCIAL SCIENCES
(Module IV Environmental Studies : 1 hour per week
Other modules : 2 hours per week)

PART - A TECHNICAL COMMUNICATION

Module I (25 hours)

Oral Communication: starting and ending a conversation; telling and asking people to do things; expressing opinions and ideas, decisions and intentions, offers and invitations, feelings, right and wrong, numbers and money.
Purpose and audience; dealing with customers and clients; face-to-face discussions; meetings and attending meetings; checking understanding; raising questions; giving and receiving feedback; using body language; leading and directing discussions; concluding discussions; using graphics in oral presentations

Reading Comprehension and reference skills: skimming and scanning; factual and inferential comprehension; prediction; guessing meaning of words from context; word reference; comprehending graphics in technical writing.
Reading strategies; reading speed; reading between the lines for hidden meaning; interpreting graphics; using a dictionary; using an index; using a contents list to find information; choosing the right reference source.

Module II (20 hours)

Written Communication: note making and note taking; summarising; notes and memos; developing notes into text; organisation of ideas: cohesion and coherence; paragraph writing: ordering information in space and time; short essays: description and argument; comparison and contrast; illustration; using graphics in writing: tables and charts; diagrams and flow-charts; maps, plans and graphs.
Spelling rules and tips; writing a rough draft; editing and proof reading; writing the final draft; styling text; filling in complex forms; standard letters; CV; writing a report; writing leaflets and brochures; writing references; essay writing: expository writing; description of processes and products; classification; the instructional process; arguments and presentation of arguments; narrating events chronologically.

PART - B SOCIAL SCIENCES

Module III (15 hours)

Science, Technology and Ethics

Impact of science and technology on the development of modern civilization . The philosophy of modern science – scientific determinism – uncertainity principle. Relevance of scientific temper. Science and religion. Science and technology in developing nations. Technological advances of modern India. Intermediate and appropriate technology. Development of technical education in India.
Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professional ideals and virtues - Attributes of an ethical personality – Theories about right action – Self interest.
Responsibilities and Rights of engineers – Collegiality and Loyalty – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Professional rights.

Module IV

Environmental Studies : **(30 hours)**

Natural resources – issues related to the use and over exploitation of forest resources , water resources, mineral resources, food resources and energy resources – role of an individual in conservation of natural resources – equitable use of resources for sustainable life styles.
Concept of an ecosystem – structure and function – energy flow in the ecosystem – ecological succession - food chains, food webs and ecological pyramids – structure and functions of a forest ecosystem and an aquatic eco system.
Definition of biodiversity – genetic, species and ecosystem diversity – biogeographical classification of India – Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
Causes, effects and control measures of air pollution, water pollution, soil pollution , noise pollution, marine pollution, thermal pollution and nuclear hazards – Causes, effects and control measures of urban

and industrial solid wastes –Role of an individual in prevention of pollution - An overview of the various environmental legislations in India – Issues involved in enforcement of environmental legislation.
The concept of sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, water shed management – Resettlement and rehabilitation of people ; its problems and concerns - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust – Population growth and problems of population explosion – Environmental ethics : issues and possible solutions..

Text Books:

Meenakshi Raman and Sangeetha Sharma	*Technical Communication : Principles and Practice, Oxford University Press, 2004*
Rajagopalan. R	*Environmental Studies : From Crisis to Cure*, Oxford University Press, 2005
Jayashree Suresh and B.S. Raghavan	*Professional Ethics*, S. Chand & Company Ltd, 2005.
WC Dampier	*History of Science*, Cambridge University Press.

References:

Adrian Doff & **Christopher Jones,**	*Language in Use* . Upper intermediate, self-study workbook & classroom book, Cambridge University Press,2000.
Krishna Mohan & **Meenakshi Raman**,	*Effective English Communication* ,Tata Mc-Graw Hill,2000.
Edmund D. Seebaur & Robert L. Barry	*Fundamentals of Ethics for Scientists and Engineers,* Oxford University Press, 2001
Krishna Mohan & **Meera Banerji**,	*Developing Communication Skills* Mac Millan India Ltd,2000.
Rajendra Pal & JS Korlahalli	*Essentials of business communication*, S. Chand & Company Ltd
Sarah Freeman,	*Study Strategies*, Orient Longman, 1978.
Meenambal T , Uma R M and K Murali	*Principles of Environmental Science and Engineering*, S. Chand & Company Ltd, 2005

University Examination pattern

The question paper will have two parts. Part A (Technical Communication) will cover Modules I, II and will have a weightage of 50 marks. Part B (Social Sciences) will cover Module III and Module IV (Environmental Studies) and will have a weightage of 50 marks. Part A and Part B will have to be answered in separate answer books.

Part A

University examination pattern

Q I - 4 short type questions of 5 marks, 2 each from module I and II
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one

Part B

University examination pattern

Q I - 5 short type questions of 4 marks, 2 from module III and 3 from module IV
Q II - 2 questions A and B of 10 marks from module III with choice to answer any one
Q III - 2 questions A and B of 20 marks from module IV with choice to answer any one

CE/CS/EB/EC/EE/EI/ IT/ ME/SE 110

COMPUTER PROGRAMMING LABORATORY

1. Study of OS commands. General introduction to application packages.
2 Programming using C control structures & pointers.
3. Searching & sorting
4. Creation and use of databases in a suitable database package
5. Programming exercises in C.

Note: 50% Marks is earmarked for continuous evaluation and 50% marks for end semester examination to be assessed by two examiners. A candidate shall secure a minimum of 50% marks separately for the two components to be eligible for a pass in that subject.

CE/CS/EB/EC/EE/EI/ IT/ ME/SE 111

ELECTRICAL AND MECHANICALWORKSHOPS

ELECTRICAL WORKSHOP

1. One lamp controlled by one switch
2. Series and parallel connections of lamps.
3. Stair case wiring.
4. Hospital Wiring.
5. Godown wiring.
6. Fluroscent lamp.
7. Connection of plug socket.
8. Different kinds of joints.
9. Transformer winding.
10. Soldering practice.
11. Familiarisation of CRO.

MECHANICAL WORK SHOP

1) Fitting Shop.
2) Sheet Metal Shop
3) Foundry Shop
4) Welding Shop
5) Carpentry Shop

(Preliminary exercises for beginners in all shops. Specific models may be designed by the teachers.)

Introduction to the use of concrete mix.

Note: 50% Marks is earmarked for continuous evaluation and 50% marks for end semester examination to be assessed by two examiners. A candidate shall secure a minimum of 50% marks separately for the two components to be eligible for a pass in that subject.

CE/ME/EC/CS/SE/IT/EB/EI 301 ENGINEERING MATHEMATICS 1I

MODULE 1

Matrices and Vector spaces: Rank of matrix, Echelon and normal form, Solutions of linear systems of algebraic equations, Eigen values and Eigen vectors, Cayley Hamilton theorem (non proof).

Vector Spaces – Subspaces, - Linear Independence of vectors-Linear span-Dimension and Basis. Linear transformations.

MODULE II

Fourier series and Fourier integrals: Forier series of Periodic functions- Euler formulae for Fourier coefficients- functions having period 2π, arbitrary period-even and odd functions-half range expansions, Fourier integral, Fourier cosine and sine transformations, linearity property, transform of derivatives, convolution theorem (no proof)

MODULE III

Lap[lace transforms: Linearity property, transforms of elementary functions, Laplace transforms of derivatives and integrals, differentiation and integration of transforms, convolution theorem (no proof) use of Laplace transforms in the solution of initial value problems, unit step function, impulse function - transform of step functions, transforms of periodic functions.

MODULE IV

Vector calculus: Scalar and Vector point functions-Gradient and directional derivative of a scalar point function- Divergence and Curl of a vector point functions-their physical meanings.

Evaluation of line integral, surface integral and volume integrals, Gauss's divergence theorem, Stoke's theorem (No Proof of these theorem), conservative force fields, scalar potential.

TEXT BOOKS

Advanced engineering mathematics: R.K.Jain, S.R.K.Iyengar, Narosa Publishers.

Advanced engineering mathematics: C.R.Wilie & L.C.Barrett, Mgh

REFERENCES

Mathematical techniques for engineers & scientists Larry C Andrews, Ronald C Philips, Phi Publishers

Advanced engineering mathemartics M.C.Potter, J.L.Goldberg Oxford Unversity Press

Higher engineering mathematics: B.S.Grewal, Khanna Publihsers

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

CS/EB/EC/EI/IT/ME 302 ELECTRICAL TECHNOLOGY

Module I

Transformers : working principles and elementary theory of an ideal transformer, Constructional features of single phase transformer, emf equation, turns ratio, vector diagram, equivalent circuit, impedence transformation, transformer losses, flux leakage, efficiency, open circuit and short circuit test, load test. Auto transformer – working principle and saving copper, basic idea of current transformer and potential transformer, distribution and power transformer, applications, standard rating, IS specifications.

Module II

Basic principles of electrical machines: Concepts of motoring and generating action, **DC machines:** Main constructional features, principles of operation, types of generators, emf equation, characteristics, applications, armature reaction and commutation, types of efficiency, speed control, testing, load of dc machines.

Module III

AC Machines : Alternator- rotating field, speed and frequency, effect of distribution of winding, coil span, characteristics, emf equation, losses and efficiency, regulation (emf method only), applications, synchronous motor-principles of operation, over excited and under excited, starting, applications, synchronous capacitor.
Induction Motor: Induction motor, principles of operation, constructional features of squirrel cage and slip ring motors, torque-slip characteristics, starting, speed control, losses and efficiency.

Module IV

Generation, transmission & distribution of electrical energy: Different methods of power generation-thermal, hydro-electric, nuclear, diesel, gas turbine stations(general idea only), electrical equipment in power stations, concept of bus bar, load dispatching, methods of transmission, transmission lines, overhead lines and insulators, corona and skin effect of DC & AC distribution, substation (elementary idea only)

References

1) Electrical Machines : By F.S.Bimbra, Khanna publications.
2) Advanced Electrical Technology : By H.Cotton, Wheeler publications.
3) Electrical Machines : Nagarath & Kothari, (TMH)

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 303 MECHANICS OF SOLIDS

Module I

Tension, Compression, and Shear: Normal stress and strain, stress-strain diagrams, elasticity and plasticity, linear elasticity and Hooke's law, shear stress and strain, allowable stresses

Axially loaded members: Deflections of axially loaded members, statically indeterminate structures, temperature and pre-strain effects, strain energy

Analysis of stress and strain: Plane stress, plane strain, principal stresses and maximum shear stresses, Mohr's circle for plane stress, spherical & cylindrical pressure vessels

Module II

Torsion: Torsion of circular bars, pure shear, relation between modulus of elasticity and modulus of rigidity, power transmission, strain energy in torsion

Shear force and bending moment: Types of beams, shear force and bending moment, relationship among load, shear force, and bending moment, shear force and bending moment diagrams

Module III

Stresses in beams: Normal strains in beams, normal stresses in beams, cross sectional shapes of beams, shear stresses in beams, beams with axial loads, Combined axial, bending, and torsional loads.

Theories of failure: Various theories of failure and their applications to ductile and brittle materials.

Module IV

Deflections of beams: Differential equations of the deflection curve, deflections by integration, Macaulay's method, moment area method, deflections of non prismatic beams, deflections of statically indeterminate beams- proped cantilevers and fixed beams

Columns: Buckling and stability, Euler's equations for columns with different support conditions,

TEXT BOOKS

Gere & Timoshenko: Mechanics of Materials, CBS Publishers

E.P.Popov : Introduction to mechanics of solids, Pearson Education.

References

1) Beer & Johnston: Mechanics of Solids, Mc Graw Hill

2) Shames & Pittaresi: Mechanics of Solids

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 304 FLUID MECHANICS

Module – I

Introduction to Fluid flows - distinction between fluids and solids - viscosity and its effects – forces in fluids – surface tension and its effects – basic equations of fluid statics – pressure- variation of pressure in a static fluid- absolute and gauge pressure- measurement of gauge pressure- – pressure in the atmosphere – hydrostatic forces on plane and curved surfaces-centre of pressure – buoyancy and stability of submerged and floating bodies- metacentric height – Eulerian and Lagrangian methods – Classification of fluid flow – steady and unsteady flow – uniform and non-uniform flow – rotational and irrotational flows-one, two and three dimensional flows- stream lines – path lines – stream tube – stream surfaces – streak lines – Control volume – Reynolds Transport Equation

Module – II

Basic equation for one-dimensional flow through a stream tube and along a streamline – Euler's equation – Bernoulli's equation and its limitations-measurement of velocity-Pitot tube-Venturimeter - Orificemeter –Rotameter-Flow through orifice-Hydraulic coefficients-Experimental determination of hydraulic coefficients-Time of emptying a tank through an orifice at its bottom-Notches and weirs - fully developed flow through pipes-Reynold's experiment-laminar and turbulent flow- general equation for friction – laminar flow in circular pipes – Darcy Weisbach equation – friction factor – minor losses in pipes

Module – III

Introduction to two dimensional inviscid incompressible flows – equation of continuity in the differential form – velocity and acceleration-velocity potential function and stream function-vortex flow-uniform flow-source flow-sink flow- concept of stream function – rotational and irrotational of flow – velocity and acceleration in steady and unsteady flow - circulation and vorticity – stream function – velocity potential – one dimensional flow along a stream line – uniform flow – source and sink flow – free and forced vortex flow – Doublet flow – Vortex pair – Rankine half body – flow around cylinders – Magnus effect

Module – IV

Introduction to Boundary layers – development of boundary layer – boundary layer thickness – displacement thickness – momentum thickness – drag on a flat plate – boundary layer separation – control of separation – wakes-Navier Stokes equation – Blassius solutions for flow over a flat plate - turbulent flow – Karman vortex street – Vortex shedding – vortex sheet – vortex filament – flow visualization technique – Subsonic Wind Tunnel testing, Heleshaw experiment

TEXT BOOKS:

1. Introduction to Fluid Mechanics, Shaughnessy, Katz & Schaffer, OXFORD
2. Mechanics of Fluids: Bernard Massey, Eswar Press

REFERENCE BOOKS:

1. Fluid Mechanics, Mc. Donald, McGraw Hill
2. Fluid Mechanics, Frank M White, McGraw Hill
3. Engineering Fluid Mechanics, K. L Kumar, S Chand & Co.

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 305 METALLURGY AND MATERIAL SCIENCE

Module I

Crystallography : crystal structure, space lattice, crystal systems, miller indices of crystal planes and directions, atomic density of crystallographic planes and lines, atomic packing factor, coordination number, inter planar spacing.

Solidification of metals : homogenous and heterogeneous nucleation, crystal growth, grains and grain boundaries, equi-axed and columnar grains, dendritic pattern, polymorphism.

Crystal imperfections : point defect, line defect, edge dislocation, screw dislocation, interaction between dislocation, planar defects, stacking faults, grain boundary, twist and twin boundaries, volume defects.

Diffusion : mechanism of diffusion in crystals, types of diffusion, factors affecting diffusion, Fick's law of diffusion, metallurgical application of diffusion.

Module II

Phase: Equilibrium between phases, Gibb's phase rule, solid solution, interstitial, substitutional, ordered and disordered types, Hume – Rothery rules, equilibrium phase diagrams of binary alloys complete solid solubility, partial solid solubility, no solid solubility,: eutectic, peritectic and eutectoid reactions, Cu- Ni, Cd-Bi, Pb-Sn, Ag-Pt, and Fe-C systems as examples.

Heat treatment of steel: Definition and aims of heat treatment, T T T diagram, isothermal and continuous cooling, annealing, normalizing, hardening, tempering, austempering, martempering, hardenability of steels, jomini test, surface treatments –case hardening, carburising, cyaniding, nitriding, flame hardening, induction hardening, metal coating- hot dipping, electro plating, metal cladding, impregnation, metal spraying.

Module III

Deformation of metals : Elastic, anelastic and visco elastic behaviour, plastic deformation, mechanism of slip, slip planes and slip directions, mechanism of twinning, strengthening mechanisms, work hardening, grain boundary hardening, precipitation hardening, cold working, hot working, recovery, recrystalisation and grain growth.

Failure of metals : creep, mechanism of creep, creep curves, creep resistant materials, fracture, brittle fracture, Griffith's theory, ductile fracture, ductile-brittle transition, protection against fracture, fatigue, mechanism of fatigue, S-N Curve.

Module IV

Cast Irons : classification- grey, white, malleable, and spheroidal graphite cast irons, composition, properties and uses.

Steels : Classification of steels, function of alloying elements of steels, composition and properties of common commercially important alloy steels.

Non-ferrous alloys : composition, properties and use of common commercial alloys of Cu, Al, Mg, bearing metals.

References

1) L.W. Van Vlack : Elements of material science – Addison – Wesley.
2) Reed Hill : Physical metallurgy principles – Affiliated east-west press New Delhi
3) Clark & Varney : Physical metallurgy for engineers – Van Nostrand
4) V. Raghavan : Material science and engineering, Prentice Hall of India
5) Dieter : Mechanical metallurgy, McGraw Hill
6) Avner: Mechanical metallurgy, McGraw Hill

7) Narula : Material Science, Tata McGraw Hill
8) B.K.Agarwal : Introduction to engineering materials, Tata McGraw Hill
9) Manas Chanda : Science to Engg. Materials Vol I, II and III, Macmillan Co. of India.

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 306 MACHINE DRAWING

Note: *The examination will be of 4 hours duration*

Module I
Screwed fastenings: Screw thread forms, V and Square threads, Conventional representation of threads, Hexagonal headed bolt and nut, Square headed bolt, Nut locking arrangements, Foundation bolts- ray bolt and Lewis foundation bolt.

Cotter and Pin joints: Socket and Spigot joints, Gib and Cotter joint for rectangular rods, Sleeve and Cotter joints, Knuckle joint.

Module II

Pipe joints : Coupler joints, Nipple joints, Union, Socket and Spigot joints, Integral flanged joints and Hydraulic joints.

Couplings: Parallel and Tapered sunk keys, Saddle keys, Feather keys and Pin keys, Muff coupling, Protected type flange coupling, Pin type flexible coupling.

Bearings : Solid journal bearings, Bushed bearings, Plummer block, Foot step bearing, Thrust bearings.

Module III

Assembly of machine parts: Machine Vice, Tail-Stock of Lathe

Steam Engine parts: Stuffing box, Cross head.

I.C. engine: Piston and Connecting rod.

Valves: Steam stop valve, Spring loaded safety valve, Lever safety valve, Ramsbottom safety valve.

Text Books:

1. N.D. Bhatt : Elementary engineering drawing (Charotar publishing house, Anand)
2. Parkinson : First year engineering drawing (Pitman, London)

References:

1. P.S. Gill : Machine drawing (Kataria & Sons, Ludhiana)
2. P.I. Varghese & K.C. John : Machine Drawing
3. K.R.Hert : Engineering drawing with problems and solutions (ELBS)

NOTE: Module I, two questions each of 30 marks, module II, two questions each of 30 marks, module III, two questions each of 40 marks with choice.

ME/MRE 307 STRENGTH OF MATERIALS LAB

Experiments

1. Shear test on M.S.Rod.
2. Vicker's pyramid hardness test.
3. Brinnel Hardness test.

4. Tension test on M.S.Rod.
5. Impact test.
6. Spring test.
7. Bonding test on R.S.J. Beam.
8. Rockwell hardness test.
9. Compression test on concrete cubes and cylinders (300 T machine)
10. Preparation of cubes and cylinders.
11. Testing of cubes and cylinders.
12. Torsion test.

Note: 50% Marks is earmarked for continuous evaluation and 50% marks for end semester examination to be assessed by two examiners. A candidate shall secure a minimum of 50% marks separately for the two components to be eligible for a pass in that subject.

ME 308: FLUID MECHANICS LABORATORY

1. Study of pipe fittings and plumbing tools
2. Experiment on notches
3. Pipe friction apparatus
4. Determination of minor losses
5. Metacentric height
6. Venturimeter

7. Orificemeter
8. Flow through orifice
9. Heleshaw experiment
10. Reynolds experiment
11. Free & forced vortex apparatus
12. Verification of Bernoullis equation

Note: 50% Marks is earmarked for continuous evaluation and 50% marks for end semester examination to be assessed by two examiners. A candidate shall secure a minimum of 50% marks separately for the two components to be eligible for a pass in that subject.

CE/ME/EC/CS/SE/IT/EB/EI 401 ENGINEERING MATHEMATICS III

MODULE 1

Complex Analytic functions and conformal mapping: curves and regions in the complex plane, complex functions, limit, derivative, analytic function, Cauchy – Riemann

equations, Elementary complex functions such as powers, exponential function, logarithmic, trigonometric and hyperbolic functions.
Conformal mapping: Linear factional transformations, mapping by elementary function like Z^2, e^z, sin z, cosz, sin hz, and Cos hz, Z + 1/Z

Module II
Complex integration: Line integral, Cauchy's integral theorem, Cauchy's integral formula, Taylor's series, Laurent's series, residue theorem, evaluation of real integrals using integration around unit circle, around the semi circle, integrating contours having poles, on the real axis.

Module III
Partial differential equations:
Formulation of partial differential equations.
Solutions of equations of the form F (p,q) = 0, F(x,p,q) = 0, F(y,p,q) = 0, F(z,p,q) = 0 F1(x,p) = F2 (y,q), Lagrange's form Pp+Qq = R
Linear homogeneous partial differential equations with constant co-efficient

Module IV
Vibrating string: one dimensional wave equation, D'Alembert's solution, solution by the method of separation of variables
One dimensional heat equation, solution of the equation by the method of separation of variables,
Solutions of Laplace's equation over a rectangular region and a circular region by the method of separation of variables.

TEXT BOOKS
Advanced engineering mathematics: R.K.Jain, S.R.K.Iyengar, Narosa Publishers.
Advanced engineering mathematics: C.R.Wilie & L.C.Barrett, Mgh

REFERENCES
Advanced Engineering Mathemartics Erwin Kreyszig, Wilsey Eastern
Complex Variables & Applications Churchill R.V.. Mgh Publishers.
Advanced engineering mathemartics M.C.Potter, J.L.Goldberg Oxford Unversity Press
Higher engineering mathematics: B.S.Grewal, Khanna Publihsers
Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 402 INDUSTRIAL ELECTRONICS

Module I
Transister Amplifiers **:** need for blacing, stabilization concepts of load line, small signal

amplifiers, h parameters model, working principle or RC coupled amplifiers, frequency response, power amplifier, classification, theory of operation and comparison, expression for gain Zin, Zo.
Concepts of Feedback: positive and negative feedback (voltage shunt and current series feedback configuration only)

Module II
Wave shaping networks**:** RC differentiator and integrator, clipping and clamping circuits using diodes, differential amplifier, common mode and differential mode operations, characteristics of OPAMP, applications, summer, Integrater, Differentiator and scale changes.

Module III
Oscillators**:** sinusoidal and non sinusoidal oscillation, conditions for oscillation, basics of RC and LC oscillators (RC phase shift Oscillator and Hartely Oscillator) transister as a switch, classification, transistorized sweep generator
Multivibrators **:** Monostables, bistables, astable generator, working principle of astable multivibrators only.

Module IV
Thyristers **:** classifications, SCR, series and parallel operation of SCR. Single phase controlled rectifier, half wave and full wave. Half controlled and fully controlled-wave forms.
Power suppliers**: -** Transisterised regulated power supply using Zener diodes, theory of operation, regulation characteristics.
SMPS – UPS (Basic concept and block diagram treatment only)
Industrial heating: Induction heating, dielectric heating, principle and applications, application of power electronics in welding.

References:
1) Electronic Devices and Circuits : Milman & Halkias (McGraw Hill)
2) Integrated Electronics : Millman & Halkias (McGraw Hill)
3) Basic Electronics : Bhargava
4) Power Electronics : NED Mohan
Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 403: ADVANCED MECHANICS OF SOLIDS

Module I
2D problems in Cartesian co-ordinates:

stress & strain at a point, components of stress & strain , Hooks law plane stress & plane strain, measurement of surface strains, construction of Mohr circle for stress & strain , strain rosettes, differential equations of equilibrium , boundary conditions, compatibility equations, stress function. Solution by polynomials, St.Venant's principle, bending of a cantilever loaded at the end.

Module II

2D problems in polar co-ordinates

General equations in polar co-ordinates. Stress distribution symmetrical about an axis pure bending of curved bars. Strain components in polar coordinates, displacement for symmetrical stress distribution, rotating disks, thick cylinders, pure bending of curved bars.

Module III

Analysis of stress & strain in 3D

Principal stresses, stress ellipsoid, stress invariants, maximum shearing stress, homogenous deformation. Strain at a point, rotation, differential equations of equilibrium, compatibility. Equations of equilibrium in terms of displacements Stretching of a prismatic bar by its own weight

Energy methods: principle of virtual work, reciprocal theorems, strain energy methods, Castigliano's theorems.

Module IV

Unsymmetric bending, shear flow, shear centre.

Torsion of noncircular straight bars, elliptic cross sections. Membrane analogy. Torsion of thin tubes, open and closed sections.

TEXT BOOKS:

1) Theory of Elasticity : Timoshenko & Goedier, McGraw Hill

2) Advanced Mechanics of Materials: Solecki & Conant: Oxford University Press

REFERENCE

1)Advanced Mechanics of Solids : L.S. Srinath, Tata McGraw Hill

2) Solid Mechanics: SMA Kazimi, Tata McGraw Hill

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 404 APPLIED THERMODYNAMICS

Module I

First and second law of thermodynamics, Carnot theorem, Thermodynamic temperature scale, Internal Energy and entropy, Claussius inequality, entropy charge in various thermodynamic processes of ideal gases, Application of first and second law of thermodynamics for steady flow processes, reversibility, irreversibility & Availability, Tds equations, (Helmoholtz, Gibbs function & Maxwell relations) Claussius clapeyron equations.

Module II

Pure substance – PV, PT and TS systems – PVT surface – Properties of steam – steam table and Mollier diagram – Analysis of vapour process – thermodynamic analysis of steam power cycles – Rankine, reheat, and regenerative – binary vapour cycles – modern steam generators – performance calculations of boilers.

Module III

Ideal, perfect and real gases, Properties of Mixtures of Gases and Gas and vapours: Dalton's law of Partial Pressure, Amagat's law of Partial volume, Volumetric and Gravimetric analysis of Gas mixtures, Gibb's Dalton Law, Mean value of Gas constant, Equivalent Molecular weight, Density, Specific volume, specific heat and Molar heat capacity of gas mixture, Advanced Problem on Adiabatic Mixing.

Air compressors – Reciprocating and rotary compressors

Module IV

Fuels and combustion – Solid, liquid and gaseous fuels – calorific value – calorimeter – combustion equation – Air – Fuel ratio gravimetric & volumetric analysis – excess air Enthalpy and Internal Energy of Combustion – application of first law of thermodynamics to chemical reaction (combustion), adiabatic flame temperature – application of second law of thermodynamics to chemical reaction.

TEXT BOOK

1. Engineering Thermodynamics D.B. Spalding & E.H.Cole
2. Engineering Thermodynamics Van Wylon

REFERENCE

1. Thermodynamics J.P.Holman
2. Engineering Thermodynamics P.K.Nag
3. Engineering Thermodynamics Bacon, Butterworth

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 405: HYDRAULIC MACHINERY

Module I

Dimensional Analysis & Similitude : Rayleigh's method, Buckingham's Pi theorem, nondimensional parameters in fluid mechanics and machinery – principles of similitude –

geometric, kinematic and dynamic similarities – model studies. Physical meaning of important dimensional groups of fluid mechanics and their practical use.
Dynamic action of fluid : Momentum equation applied to a control volume, impact of jets, flow of an incompressible fluid over fixed and moving vanes, work done and efficiency.

Module II
Hydraulic turbines: Impulse and Reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine, their constructional features, Velocity triangles, Performance characteristics – non dimensional parameters for comparative study of turbine study of turbine performance, Specific speed, Unit speed, Unit power, theory of draft tubes, speed regulation of turbines, Cavitation, Selection of type and speed of turbines.

Module III
Pumping machinery: general features of positive displacement and rotodynamic pumps, centrifugal pumps, classification, principle of working, velocity diagrams, work done, efficiency, minimum speed, specific speed, losses in pumps, circulatory flow, multistage pumps, propeller pumps, priming, Cavitation and its significance.
Reciprocating pumps: Working, single acting and double acting pumps, Slip, Acceleration head, effect of friction, use of air vessels, Indicator diagrams, efficiencies, pump characteristics.

Module IV
Hydraulic Press, Hydraulic Ram, Hydraulic Intensifier, Hydraulic lift, Hydraulic Accumulator, Hydraulic Crane, Hydraulic Coupling, Hydraulic Torque Converter, Surge tank, Vane pump, gear pump, Working principles of axial and radial pumps, Application to hydraulic devices, Fluid transients, Free and Forced Vortex Apparatus

TEXT BOOKS

1. D.G.Shepherd : Principles of turbo machinery-Mac Millan Publishing Co. Inc.
2. Agarwal : Fluid mechanics & Machinery, TMH.

REFERENCES

1. Douglas, Gasiorek, and Swaffield : Fluid mechanics – Pitman
2. Daugherty & Franzini : Fluid mechanics with Engg. Applications McGraw Hill
3. Vallentine : Applied hydrodynamics – Butterworths – London.
4. Herbert Addison : A treatise on applied hydraulics.
5. A.J. Stepanof : Centrifugal and axial flow pumps, Wiley, New York.
6. Som & Biswas : Introduction to fluid mechanics & Machinery (TMH)
7. Shaughnessy, Introduction to Fluid Mechanics, OXFORD

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 406: MANUFACTURING PROCESS

Module I

Metal casting process: Introduction-advantages and limitations-applications-casting terms
Patterns: Pattern allowance-pattern materials-types of patterns- colour codes
Moulding materials: Moulding sand composition-testing sand properties-sand preparation-moulding sand properties-types of sand moulds-moulding machines
Cores: Core sand, types of cores, core prints, chaplets, forces acting on the moulding flasks
Gating system: Elements of gating system, gates, pouring time, sprue, gating ratio, slag trap system, risering design-caine's method, modulus method, chills-feeding aids

Module II

Product design for sand casting: designing for economical moulding –designing for eliminating defects-features to aid handling
Casting cleaning and casting defects-fettling-defects in casting
Special casting process: Shell moulding –precision investment casting –permanent mould casting –die casting –centrifugal casting-continuous casting
Casting metallurgy

Module III

Metal forming process: nature of plastic deformation-hot working and cold working
Rolling: principle, rolling stand arrangement, rolling load, roll passes
Forging: operations, smith forging, drop forging, press forging, machine forging, forging defects, forging design
Extrusion-hot and cold extrusion, tube extrusion, wire drawing swaging
Sheet metal operation- shearing operation, drawing, spinning, bending, stretch forming, embossing and coining

Module IV

Metal fabrication process: introduction to fabrication process, gas welding and cutting. Electric arc welding-principle of arc, arc welding equipment, electrodes, carbon arc welding, TIG GMAW, SAW, arc cutting
Resistance welding: principle –spot, seam, projection, upset, flash welding
Other welding process: Thermit welding, electro slag welding, EBW, laser beam welding, forge welding, friction welding, diffusion welding, explosion welding
Welding design: heat input, heat flow, distortion, metallurgy of welding, defects in welding, brazing, braze welding and soldering

Reference

1* Campbell, J.S , Principles of Manufacturing and Process, McGraw Hill, NewYork
2 Cox,LL , Beginner's Guide to Pattern Making, Newnes, London,
3 Heine, RW, CR Lpoer and PC RosenthalPrinciples of Metal Castings , McGraw Hill, New York *
4 Chvorinv,N, Theory of Solidification of castings, Geisserei
5 Tselikov, AI and VV Smirnov, Rolling Mills, Pergamon Press, Oxford
6 Rowe, GW, Elements of metal working theory , Edward Arnold, London
7 Pearson, CE and RN Parkins , The extrusion of Metals, Chapman & Hall London
8 Hinman,CW , Prss Working of Metals, McGraw Hill , New York
9 Little ,RL Welding and welding technology, McGraw Hill , New York *
10 Patte, HE Technological Advances in welding and other joining process, Battelle Press, Columbs

* can be used as text book

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 407 ELECTRICAL LAB

1. Determination of voltage current relation of a linear resistance and incandescent lamp.

2. Measurement of high and low resistances using voltmeter and ammeter R, L & C series and parallel circuits – measurement of voltage – current relation and verification by calculation - plotting the instantaneous power against time.
3. Calibration of the single phase energy meter by direct loading at various power factors.
4. Measurement of power in the three phase circuit using single, two and three watt meters for balanced/unbalanced load and three and four wire systems.
5. Determination of the efficiency and regulation of the single phase transformer by direct loading.
6. Determination of Equivalent circuit of a transformer by open and short circuit test calculation of efficiency and regulation at various loads and power factors.
7. Determination of the regulation of the alternator by emf and mmf methods.
8. Synchronization of alternator to the A.C. mains and studying the effect of changes in excitation of alternator and power input to their alternator by plotting the V-curve.
9. Starting the cage induction motor using star-delta switch and plotting the performance characteristics.
10. Conducting the no load and blocked rotor tests on slip ring induction motor – determining equivalent circuit and calculating torque-slip characteristics.
    a) Plotting OCC of a D.C. shunt generator at rated speed – determining the critical resistance.
    b) Conducting load test on D.C. shunt generator and plotting external characteristics – deducting internal characteristics.
11. Conducting load test on D.CL Series motor and plotting the performance characteristics.
12. Study of single phase capacitor start and capacitor run induction motors – plotting speed – voltage relation of single phase fan motor.

Note: 50% Marks is earmarked for continuous evaluation and 50% marks for end semester examination to be assessed by two examiners. A candidate shall secure a minimum of 50% marks separately for the two components to be eligible for a pass in that subject.

ME 408 COMPUTATIONAL LAB

Review of fundamentals of C programming, Pointers-pointer declaration-pointers and one dimensional arrays-pointers and functions, Data files- opening and closing a data file-creating a data file- processing a data file. C-graphics- drawing lines, rectangles, circles and ellipse

Numerical Techniques: Preparation of computer programs for solution of polynomial and transcendental equations: bisection method, regula falsi method, successive iteration-Newton Raphson method. Solution of system linear algebraic equations : Gauss elimination- matrix inversion, Gauss Jordan method, Gauss-Seidel method.

Numerical integration : trapezoidal rule- Simpson's 1/3 rule- Gauss quadrature formulae

Numerical solution of ordinary differential equations : Taylor series method- Runge-kutta method Numerical solution of boundary value problems.

Note: 50% Marks is earmarked for continuous evaluation and 50% marks for end semester examination to be assessed by two examiners. A candidate shall secure a minimum of 50% marks separately for the two components to be eligible for a pass in that subject.

CE/ME/EC/CS/SE/IT/EB/EI/ 501 ENGINEERING MATHEMATICS IV

MODULE 1

Probability distributions: random variables (discrete & continuous), Probability density, mathematical expectation, mean and variance of a probability distribution, binomial distribution, Poisson approximation to the binomial distribution, uniform distribution, normal distribution.
Curve fitting: method of least squares, correlation and regression, lines of regression.

Module II
Sampling distributions: Population and samples, the sampling distribution of the mean unknown(σ known), the sampling distribution of the mean (σ)the sampling distribution of the variance, point estimation, interval estimation, tests of hypotheses, null hypotheses and significance tests, hypothesis concerning one mean, type I and type II errors, hypotheses concerning two means. The estimation of variances: Hypotheses concerning one variance – Hypotheses concerning two variances.

Module III
Finite difference Operators: ∇, Δ E, δ, μ, $x^{(n)}$
Newton's Forward and Backward differences interpolation polynomials, central differences, Stirlings central differences interpolation polynomial. Lagrange interpolation polynomial, divided differences, Newton's divided differences interpolation polynomial.
Numerical differentiation: Trapezoidal and Simpson's rules, compounded rules, errors of interpolation and integration formulae. Gauss quadrature formulae (No derivation for 2 point and 3 point formulae)

Module IV
Numerical solutions of ordinary differential equations: Taylor series method, Euler's method, modified Euler's method, Runge-Kutta formulae 4^{th} order formula,
Numerical solution of boundary value problems: Methods of finite differences, finite difference methods for solving Laplace's equation in a rectangular region, finite differences methods for solving the wave equation and heat equation.

TEXT BOOKS:
Probability And Statistics For Engineers: Irvrin Miller & Freiend, Prentice Hall Of India
Numerical Methods: S.S.Sastry, Phi Publishers.

REFERENCES:

Numerical Methods: P.Kandaswamy.K.Thilagavathy, K.Gunavathy, S.Chand & Co.
Probability, Random Variables and Stochastic Processes A.Papoulis, Mgh Publishers
Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME502 METROLOGY AND MACHINE TOOLS

Module I

General measurements concepts: precision and accuracy, Methods for estimating accuracy and precision, measuring errors.

General principle of measurements: line and end measurements, standards; linear measurements, basic units, and quantities for displacement, mass, time, temperature & optics; systems of limits and fits; tolerances for linear dimensions.
Gauges*:* classification, types of gauges, gauge maker's tolerances, wear allowance, gauges materials.

Module II

Measurement of angles & tapers: sine bars, angle gauges: auto collimator, clinometer & spirit level; taper gauges, bevel protractors.
Measurement of surface finish: surface structure, integrity, texture, roughens, waviness, lay, RMS & CLA values, roughness values produced by machining processes
Optical measuring instruments: interferometry, optical flats, optimeters, and optical projectors, tool maker's microscope, limitations

Module III

Types and classification of lathes: Specifications-method of holding work and tool, accessories, attachments-operations and types of tools for each operation, Capstan and Turret lathe
Drilling and boring machines:- types and specifications-description of tool and work holding devices-boring tools and reamers-drilling of holes, countersinking and counter boring operations
Shaping, planing and slotting machines: Types and specifications-quick return motion-hydraulic feed and its advantages- work holding devices-types of operation

Module IV

Grinding, Horning and Lapping: Types and methods of operations- machines-gear hobbing - gear cutting - gear finishing and gear shaping operations
Milling machines: - types, specifications, operations and milling cutters-Indexing head and its use-method of indexing-dividing head-milling of plane surface,
Numerical Control (NC) machine tools: Elements, classification (basics only)-NC tooling-design of NC/CNC tooling-automated chip less process.
Automatic machines: Semiautomatic multi tool central lathes-automatic cutting of machines- Swiss type automatic screw machines, multi spindle automatic special purpose machine tools- program controlled machine tools-copying machines.

REFERANCE

1. Hume - Metrology, McDonald
2. Sharpe - Metrology, ELBS
3. Taher - Metrology, ELBS
4. Gerling - All about Machine tools
5. W.A.J.Chapman - Workshop Technology: Vol. 1, 2 and 3
6. H.M.T. - Production Technology

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 503: MECHANICS OF MACHINERY

Module 1

Introduction : Machines and mechanisms, lower and higher pairs, kinematic chains, kinematic inversions of four bar, slider crank and double slider crank chains, equivalent

linkages, Lower pairs - Pantograph, Paucellier mechanism, Thomson indicator mechanism, Watt mechanism, Geneva mechanism, Steering mechanism, Hooke's joint.
Kinematic analysis of plane mechanisms: General case of plane motion, Arnold Kennedy's theorem, velocity analysis using instantaneous center method, velocity and acceleration diagrams, Coriolis component of acceleration

Module 2
Robot Kinematics: Direct kinematics-Linear and rotational velocity of rigid bodies, motion from link to link, Jacobian, Singularities, static forces in force domain, transformation of velocities and forces, Inverse Kinematic transformations.
Introduction to synthesis: synthesis of slider crank mechanism, crank and rocker mechanism. Optimum transmission angle, synthesis of four bar links, three and four position synthesis. Overlay method, Coupler curve synthesis, Freudenstein's equations for Four bar and Slider crank mechanism.

Module 3
Spur gear: gear terminology, conjugate gears, involute arc of motion, contact ratio, generation of gear teeth profiles, interference, cycloidal and involute gear characteristics, interchangeable gears, standard and non-standard tooth profiles, description of various types of gears like helical, bevel, worm.
Gear Trains: Analysis of simple, compound, reverted and epicyclic gears, solution of epicyclic gear train problems, gear train in differentials.

Module 4
Cams: Classification of cams and followers, geometry of radial cams, displacement diagrams, follower motion, simple harmonic, cycloidal, parabolic, graphical layout of cam profiles, displacement, velocity, acceleration and jerk relations, pressure angle, analysis of tangent cam, convex and concave sided cams with roller follower and flat faced follower polynomial cam design.
Friction: Laws of friction, Limiting angle of friction, Efficiency of inclined plane, flat pivot friction, conical pivot friction, Screw friction, Screw Jack, Torque required to lift and lower the load by screw jack, Efficiency of a screw jack.

TEXT BOOKS
Theory of Machines and Mechanics: Uicker, Pennock, and Shigley, Oxford University Press

REFERENCE
Introduction to Robotics, Mechanics and Control: Craig, Pearson Education.
Theory of Machines: Rattan, Tata McGraw Hill
Theory of Machines and Mechanisms: Ghosh & Mallick, Prentice Hall India
Machines & Mechanisms : Myszka, Pearson Education
Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 504 THERMAL ENGINEERING

Module I
Air standard cycles, Otto, Diesel, Dual, Brayton, Stirling cycles. Actual cycles of four stroke and two stroke IC Engines, valve timing diagram – Engine testing – Performance

and characteristics of constant speed and variable speed engines – heat balance test – Morse test – retardation test – effect of dissociation – variable specific heads and heat losses – scavenging – objectives – effects and methods – Efficiencies (thermal, mechanical and volumetric efficiencies)

Module II

Systems and components of IC Engines – fuel systems – Ignition systems – Cooling – starting – lubrication – governing of IC engines – super charging of SI and CI Engines – turbo charging – exhaust emissions of IC engines –alternate Potential Engines – free piston engines – Wankel Engine and Stratified charged engine automotive transmission system and its components.

Combustion in IC engines – flame propagation normal and abnormal combustion detonation – Pre ignition – after burning – HUCR – fuel rating – additives in petrol – combustion chambers of SI engines – combustion in CI engines – phase of normal combustion diesel knock – effect of engine variables on diesel knock – cetane number – additives in diesel – combustion chambers of CI engines.

Module III

Steam nozzles – mass flow rate – throat pressure for maximum discharge – throat area – effect of friction – super saturated flow – effect of back pressure

Steam turbines – types and classification– velocity diagram – force on blades, W.D. by blades, blade or diagram efficiency- effect of friction on blades.

Module IV

Gas turbine plants – open and closed cycles – thermodynamics cycles – regeneration – reheating – intercooling – efficiency and performance of gas turbines – rotary compressors – analysis – centrifugal and axial flow compressors – combustion chambers of gas turbines – cylindrical – annular and industrial type combustion chamber design – combustion intensity – combustion efficiency – pressure loss combustion process and stability loop axial flow turbines

TEXT BOOK

1. Cengel and Boles, Thermodynamics- An Engineering Approach, Tata McGraw Hill
2. Cohen & Rogers, "Gas Turbine Theory", Longmans
3. M.I. Mallev, Internal Combustion Engines

REFERENCE

1. Engineering Thermodynamics Bacon, Butterworth
2. Elements of Internal Combustion Engines Rogowsky, Tata McGraw Hill
3. Fundamentals of Internal Combustion Engines Gill, Smith & Ziurys, Oxford
4. Modern Petrol Engine Judge, Chapman & Hall

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 505 POWER PLANT ENGINEERING

Module I

Power plant economics – base load and peak load power plants -estimation of load – load curve – load factor – diversity factor – capacity factor – use factor – selection of

units – number and size – scheduling operation – cost of energy – depreciation and replacement – economics of plant selection.

Module II

Hydroelectric power plants – general layout – types of dams – penstock, draft tubes, surge tanks - power house equipments – site selection

Diesel engine power plant – Layout – Components of a diesel power plant – starting methods – advantages and disadvantages

Gas Turbine power plants – classification – elements of a Gas Turbine power plant

Module III

Steam power plants - General layout – fuel handling systems – types of furnaces – stokers – burning systems – types of firing : stokers, pulverized coal burners and fluidized bed combustion - power plant boilers, mountings and accessories - dust and ash handling systems – draft and chimney calculations – condensers – cooling systems - Environmental aspects of thermal power systems

Nuclear power plants - Fundamentals of nuclear fission – nuclear power plants – reactors – classification – components layout of simple plant – nuclear power safety and waste disposal.

Module IV

Non conventional energy sources – solar radiation and its measurement – Solar energy collectors – Applications of solar energy - Wind energy conversion – site selection – wind energy collectors – Energy from biomass - ocean energy possibilities and future scope – Ocean Thermal electric conversion (OTEC) – Tidal energy - geothermal energy- Magneto Hydro Dynamic (MHD) power – Fuel cells - thermo electric power - thermionic generation.

TEXT BOOK

1. E.I. Wakil, Power Plant Engineering, McGraw Hill
2. P.K. Nag, Power Plant Engineering, Tata McGraw Hill

REFERENCE

1. Morse, Power Plant Engineering, Van Nostrand Co.
2. Lee J.F., Power Station Engineering and Economy, Tata McGraw Hill
3. Robert Loftness, Nuclear Power Plants, McGraw Hill
4. Verma Mahesh, Power Plant Engineering
5. Rai G D, Non Conventional Energy Sources

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 506 INDUSTRIAL MANAGEMENT

Module I

Definitions of management-history of management-types of manager-management responsibilities-management tasks-the engineering manager. The organization-organization structures, the quality organization, organizational change, managing change
Management obligations, social and professional responsibilities
Personnel management and administration, manpower planning-recruitment, selection and training. Accidents –absenteeism and labour turnover,

Module II

Industrial relations- objectives, causes results and settlement of industrial relations, workers participation in management, collective bargaining, trade unions, principles of industrial legislations
Wage payment plans-wage incentives

Module III

Financial management: financial accounts, inflation, profitability, budgets and controls, obtaining finance, valuing a company
Control through costing: Cost accounting, valuation of stocks, allocation of overheads, standard costing, marginal costing
Investment decision: the ranking process, payback period, average rate of return, discounted cash flow

Module IV

Marketing and sales management
The market, marketing information, market segmentation, consumer and industrial markets
Product management, pricing, marketing communications, sales physical distribution
Entrepreneurship – concept Entrepreneurship development, factors affecting Entrepreneurship, project report and techno economic feasibility assessment

REFERENCES

1) Industrial Organisation and Management : Bethel et.al, McGraw Hill
2) Principles of Industrial Management : Kootnz & Donnel
3) Financial Management : Prasanna Chandra, TMH
4) Financial Management : IM Pandey , Vikas Publishing House
5) Operation Management : Fabricky et al, Tata McGraw Hill
6) Hand Book of MBO : Reddin & Ryan, Tata McGraw Hill
7) Management: concept and Strategies : J.S. Chandan , Vikas Publishing House

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 507: HYDRAULIC MACHINERY LABORATORY

1. Pelton Wheel
2. Francis Turbine
3. Kaplan Turbine
4. Centrifugal Pump
5. Variable Speed Centrifugal Pump
6. Reciprocating Pump
7. Plunger Pump
8. Gear Pump
9. Impact Of Jets
10. Hydraulic Ram
11. Subsonic Wind Tunnel
12. Study of cut models of pumps and turbines

Note: 50% Marks is earmarked for continuous evaluation and 50% marks for end semester examination to be assessed by two examiners. A candidate shall secure a minimum of 50% marks separately for the two components to be eligible for a pass in that subject.

ME 508 MACHINE SHOP

Introduction to Lathe : Spindle drive – work holding devices – types of Lathe tools –

tool holders – tool movement – selection of speeds. Feed and depth of cut – use of cutting coolants – principle of thread cutting – V-thread and Square thread – thread standards – cutting tool types – grinding of tools – selection of cutting speeds.

Practical : Exercises involving cylindrical turning, Taper Turning, Facing, Shoulder turning and curve turning – thread cutting.

Practical : Exercises on lathe – curve turning, multi start thread, drilling and boring, internal thread.

References

1) Production technology : H.M.T
2) Tool Engineer's hand book : ASTME
3) Machine tool operations 1 & 2 : Burghardt, Axllered and Anderson
4) Automatic and semiautomatic lathes : B.L.Boguslavsky, Pease publications.
5) Fundamentals of tool design : ASTME

Note: 50% Marks is earmarked for continuous evaluation and 50% marks for end semester examination to be assessed by two examiners. A candidate shall secure a minimum of 50% marks separately for the two components to be eligible for a pass in that subject.

ME 601: INSTRUMENTATION &CONTROL SYSTEMS

Module I

Applications of measuring instruments-functional elements of an instrument-instrument as transducer-generalized measuring instrument-generalized mathematical model of measuring

systems-zero order, first order and second order instruments-classification of instruments- input output configurations-methods of correction for spurious inputs -static calibration and determination of bias systematic error and random error-static and dynamic characteristics, potentiometer transducer as a zero order instrument-analysis of its loading error- mercury in glass thermometer as a first order instrument-step, ramp, frequency response-seismic instrument as a second order instrument.

Module II

Measurement of strain : strain gauge classification –un bonded and bonded strain gauges-gauge factor-strain rosettes-temperature compensation-calibration. **Measurement of force** : multiple lever system for weighing- load cells-temperature sensitivity calibration- ballistic weighing-hydraulic and pneumatic load cells. **Measurement of Torque**: water break-Heenan and Froude hydraulic dynamometer-beam and strain gauge transmission dynamometer. **Measurement of Temperature** : pressure thermometer-RTDs-compensation for lead resistance thermocouples-five laws of thermocouples and their applications-series and parallel connected thermocouples-pyrometry-optical pyrometer-infrared pyrometry-total radiation pyrometers.

Air pollution measurements : gas chromatography-ORSAT's apparatus. **Nuclear instrumentation**: Gieger Muller Counter-ionization chamber-scintillation counter.

Acoustical measurements : basic acoustical parameters-sound pressure-sound pressure levelpower- intensity-power level-microphones-sound level meter.

Module III

Principles of automatic control : transfer functions, transient response of second order systems, steady state response and error constants. Mathematical modeling of dynamic systems: state space representation of dynamic systems- mechanical systems, electrical systems, analogue systems, electro mechanical systems, liquid level systems, thermal systems, and robot arm systems, proportional, integral, derivative control.

Module IV

Stability analysis of linear systems: concepts of stability, characteristic equations, stability, analysis, determination of stability by Routh-Hurwitz criterion, Root locus, frequency response using Bode plot, and stability from Bode plot, Nyquivist criteria.

Control system components: DC and AC servo motors, tacho generators, synchros and stepper motors.

TEXT BOOKS

1) Modern control engineering : Ogata K., Pearson Education
2) Measurement systems – Application & Design: Doebelin E.O., Tata McGraw Hill

REFERENCE

1. Mechanical Measurements: Beckwith, Marangoni, Lienhard, Pearson Education
2. Modern Control Systems: Dorf & Bishop, Pearson Education
3. Modern Control Systems: B C Kuo

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 602: DYNAMICS OF MACHINERY

Module-I

Force analysis of plane motion mechanism: Static force analysis, analysis of four bar chain, slider crank mechanism, static force analysis with friction. Dynamic force analysis: D'Alembert's principle, inertia forces, dynamic force analysis of four bar and slider crank mechanism, Shaking forces, gear force analysis of spur, helical and bevel gears, Dynamics of reciprocating engines, equivalent masses, inertia force in single engine, bearing loads in single cylinder engine.

Module-II

Flywheels: Inertia torque-turning moment diagrams for multi-cylinder engines, steam engines, coefficient of fluctuation of speed and energy, flywheel mass calculation.

Gyroscopes: motion of a rigid body in 3 dimension, Gyrodynamics, gyroscope and gyroscopic couple, Gyroscopic effects on ships, aircrafts and automobiles.

Governors: Terms used in governors, Porter, Proell, Hartnell governors, sensitiveness of governors, stability, isochronous governor, hunting, effort and power of governor, controlling force, coefficient of insensitiveness.

Module-III

Balancing: Static and dynamic balancing, balancing of several masses in a plane, balancing of rotating masses in several planes, balancing of several masses in several planes. Condition of complete balancing of an engine, reciprocating and rotating parts, locomotive balancing, hammer blow, variation in tractive effort, swaying couple, Multi-cylinder inline engines, Radial and V-engines, Balancing machines and principles of working

Module-IV

Belt and Rope drives: Ratio of belt tensions, power transmitted, Centrifugal tension, initial tension, flat and V-belts and ropes.

Clutches: Analysis of single plate, multi plate and cone clutch.

Brakes: Analysis of different types of brakes-block brakes, band and internal expanding brakes, condition of self locking, power transmitted and heat generated.

Dynamometers: Rope brake dynamometers, belt transmission dynamometers

TEXT BOOKS

Theory of Machines and Mechanics: Uicker, Pennock, and Shigley, Oxford University Press

REFERENCE

Theory of Machines: Rattan, Tata McGraw Hill

Theory of Machines and Mechanisms: Ghosh & Mallick, Prentice Hall India

Machines & Mechanisms : Myszka, Pearson Education

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 603: MACHINE DESIGN-I

Module I

Introduction to design: Steps in design process, design factors, practical considerations in design, selection of materials, strength of mechanical elements, theories of failure, impact load, shock load, fatigue loading, effects of surface, size, temperature and stress concentration, consideration of creep and thermal stress in design.

Module II

Detachable joints: design of screws, standards, thread stresses, preloading of bolts, fatigue and shock load, eccentric loading. Power screws, mechanism of power screws, thread stresses, efficiency of power screws, types of keys, stresses in keys, design of socket and spigot joint, Gib and cotter, knuckle joints, design of rigid couplings and flexible couplings.

Module III

Riveted joint: Stresses in riveted joint, design of riveted joints with central and eccentric loads, boiler and tank joints, structural joints.

Springs: stresses in helical springs, deflection of helical compression and tension springs, springs subjected to fatigue loading, concentric and helical torsion spring, critical frequency of springs, leaf springs, design of automotive leaf springs.

Module IV

Welded joints: types of welded joints, stresses, design of welded joints subjected to axial, torsional and bending loads, welds subjected to fluctuating loads.

Power shafts: stresses in shafts, design of static loads, combined stresses, reversed bending and steady loads, design of shafts based on deflection and strength, critical speed of shafts.

DATA BOOK

Design data hand book-K Mahadevan and Balaveera Reddy, CBS Publishers
Design Data Hand Book-P.S.G,TECH
Design Data Book-Dr. K. Linghaigh and Prof. B.R. Narayana Iyengar, Vol. I & II

TEXT BOOKS:

1. Mechanical engineering design, Joseph Edward Shigley, TMH
2. Design of machine elements, Bhandari, TMH

REFERENCES

1. Design of machine elements, M.F Spotts, Prentice hall India
2. Machine Design, Sadhu Singh
3. Machine Design, Pandya & Shah
4. Machine Design, R.K Jain

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 604 HEAT AND MASS TRANSFER

Module I

Introduction to heat transfer – basic modes of heat transfer – conduction heat transfer – energy balance – integral and differential approaches – general heat conduction equation in Cartesian, cylindrical and spherical coordinates – initial and boundary conditions – one-dimensional steady state conduction with heat generation – conduction shape factor – temperature dependence ;of thermal conductivity – applications like extended surface heat transfer and critical insulation thickness – two dimensional steady state heat conduction – examples – unsteady state heat conduction in one dimension – lumped heat capacity system – semi-infinite solids with sudden and periodic change in surface temperature – numerical methods in conduction problems.

Module II

Convective heat transfer – Newton's law of cooling – thermal boundary layer – Prandtl number – hydrodynamic and thermal boundary layer equations – laminar forced convection heat transfer from flat plates – internal flow and heat transfer – fully developed laminar flow in pipes – turbulent forced convection – Reynolds' analogy – natural convection – natural convection heat transfer from vertical plates – condensation and boiling – film and drop wise condensation – film boiling and pool boiling – introduction to multiphase flow and heat transfer. Diffusion and convective mass transfer.

Module III

Radiative transfer – electromagnetic radiation spectrum – thermal radiation – black body, grey body and coloured body – monochromatic and total emissive power – Planck's law – Stefan-Boltzman law – Wien's displacement law – absorptive – reflectivity – transmissivity – emissivity – Kirchhoffs identity – radiation exchange between surfaces – shape factor – shape factors for simple configurations – heat transfer in the presence of re-radiating surfaces – radiation shields – surface and shape resistances – electrical network analogy.

Module IV

Heat Exchangers: Type of heat exchangers, Logarithmic mean temperature difference (LMTD, analysis using fouling factors, derivation of LMTD for parallel flow and counter flow heat exchangers, effectiveness, NTU method of heat exchanger analysis, fouling factors, simple design problems.

TEXT BOOK

1. Cengel Heat Transfer Tata McGraw Hill
2. Holman J.P., "Heat Transfer", McGraw Hill International Students Edition

REFERENCE BOOKS

1. Incorpera F.P. & De Witt D.P., "Fundamentals of Heat and Mass Transfer", John Wiley
2. Kreith F., "Heat Transfer", International Text Book Company
3. Gebhart B., "Heat Transfer", McGraw Hill
4. R.K. Rajput, "Heat and Mass Transfer"
5. Goshdostidar, "Heat and Mass Transfer"

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 605 TOOL ENGINEERING AND DESIGN

Module I

Cutting tools**:** Geometry of cutting tools and tool nomenclature, single point and multiple point cutting tools and used for turning, milling, drilling and broaching, cutting tool materials and their properties, grinding wheels and their selections.

Module II

Metal Cutting : Mechanics of chip formation, types of chips, mechanism of orthogonal cutting, velocity relationship, cutting forces, factors affection cutting forces, tool dynamometers, cutting force and power analysis, turning, drilling, milling and broaching, thermal aspects of machining, cutting fluids and their selection.

Module III

Mach inability and tool life**:** Tool wear and tool life, tool life equations, tool life specification and criteria, tool life testing, effect of machining parameters on tool life, machinability, variables affecting machinability, machinability index. Economics of Machining: Selection of optimal machining conditions, productivity of machine tools

Module IV

Jigs and Fixtures: Basic principle, elements of jigs and fixtures, location and clamping, 3-2-1 method of location, principles of pin location, radial location, v-location, cavity location, Types of clamps-strap, cam, screw, latch, wedge, and toggle clamps, hydraulic and pneumatic clamps, design considerations common to jigs and fixtures, drill jigs- leaf, box, plate and indexing jigs, milling fixtures.
Press working and die block design

References:

1) Boothroyd : Fundamentals of Metal Machining and Machine Tools - McGraw Hill
2) Sen & Bhattacharya : Metal cutting Theory & Practice – New central book agency, Culcutta
3) HMT : Production Technology – Tata McGraw Hill
4) Black : Theory of metal cutting (McGraw Hill)
5) B.J. Ranganath : Metal Cutting & Tool Design , Vikas Publishing House
6) P C Sharma : A text book of production engineering (S Chand & Co)
7) Suresh Dalela : Production Technology
8) Pandey & Shah : Modern machining processes (Tata McGraw Hill)
9) Koeingberg : Machining Science & their application (Pergamon Press)
10) Donaldson : Tool Design, Mc Graw Hill
11) ASTME : Fundamentals of Tool Design,PHI

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 606 CAD/CAM

Module I

Fundamentals of CAD: Role of computers in design, geometric modelling- wireframe and solid, modelling, engineering analysis-FEM, design review and evaluation, automated drafting, design data base, softwares used in CAD, data exchange between CAD and CAM. **Fundamentals of CAM:** Definition of automation, levels of automation, high volume discrete parts production, Detroit type of automation, transfer machines, analysis of automated flow lines, assembly machines, flow line balancing, line balancing.

Module II

Computer Numerical Control: basic theory of numerical control, advantages of NC, open and closed loop system, information flow and control theory, classification of CNC machine tools, position control and continuous path control, principles of displacement measurement, digital linear and rotary displacement transducer, analog displacement measuring system. **CNC part programming:** Manual programming, work piece modelling and computer aided part programming, G and M function, canned cycles, CAPP languages, structure and use of major CAPP languages, programming in APT.

Module III

Design features of CNC machines: Special design features to match machine tools to numerical control system **CNC tooling:** ATC, APC, features of CNC systems for lathes and machining centre. Testing of NC machine tools, static and dynamic errors.

Module IV

Basic concepts of Robotics: Introduction, basic structure of Robots, resolution, accuracy, and repeatability. **Classification and structure of Robotic systems:** PTP and CP systems, control loops of robotic systems, types of robots **Drives and Control systems:** hydraulic systems, DC servo motors, control approaches of Robots. **Applications of Robots:** handling, loading and unloading, welding, spray painting, assembly, machining. **Programming:** manual teaching, lead – through teaching, programming languages. **Sensors and Intelligent Robots:** introduction to Robotic sensors, vision systems, range detectors, force and torque sensors. **Advanced concepts in automation:** direct numerical control, CAE, CIM, FMS, computer integrated manufacturing – basic concepts of AI and expert systems for manufacturing automation

TEXT BOOKS

1. Grover & zimmers "CAD/CAM" PHI
2. Rdhakrishnan "CAD/CAM"
3. Michael P.G Grover, "Automation, Production Systems and Computer Aided Manufacturing", Prentice Hall, 1980
4. Mechatronics : HMT (TMH)

REFERENCES

1) CNC Machine Tools and Computer aided Kundra T.K, Rao P.N. and Tiwari N.K.
2) Manufacturing Engineering Hand Books 1984 SME
3) CAD/CAM theory & Practice : Zeid (TMH)
4) CNC Programming made easy: B.K.Jha , Vikas Publishing House
5) Robot Technology – Fundamental: James G Keramas , Vikas Thomson Learning

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 607 THERMAL ENGINEERING LAB

1. Determination of flash and fire points of fuels and oils
2. Viscosity of fuels and oils and its variation with temperature
3. Determination of Calorific values of fuels
4. Performance of simple journal bearings
5. Valve timing diagrams of I.C. engines
6. Performance test on Petrol and Diesel engine
7. Forced convection heat transfer for tube flow
8. Performance test on air compressors
9. Test on air conditioning equipment and refrigeration equipment.

Note: 50% Marks is earmarked for continuous evaluation and 50% marks for end semester examination to be assessed by two examiners. A candidate shall secure a minimum of 50% marks separately for the two components to be eligible for a pass in that subject.

ME 608 METROLOGY AND MEASUREMENTS LAB

1. Use of vernier caliper, micrometer, depth gauge and height gauge – source of error in
1. measurement ideas on range, precision and accuracy
2. Slip gauges and their use in linear measurements.
3. Ideas on tolerance allowance, limits, fits.
4. Dial gauges – their use in the measurement of small linear displacements, parallelism and concentricity.
5. Measurements using tool maker's microscope – tool angles and tool wear.
6. Measurement of surface roughness – surface roughness parameters – surface finish evaluation using perth-O-meter/ Talysurf
7. Standards for screw threads – Screw thread measurements using Universal Measuring
8. Microscope/Measuring Projector.
9. Use of measuring Projector to evaluate form error.
10. Microstructure studies using Metallurgical Microscope.
11. Lathe tool dynamometer – study and use of measurement of cutting forces in turning.
12. Milling forces – Milling parameters – measurement of milling forces in slab
13. milling operations.
14. Measurement of drilling thrust and torque using drill toll dynamometer.
15. Study of grinding wheel and grinding parameters – experiments in grinding.
16. Non-destructive tests.

Note: 50% Marks is earmarked for continuous evaluation and 50% marks for end semester examination to be assessed by two examiners. A candidate shall secure a minimum of 50% marks separately for the two components to be eligible for a pass in that subject.

ME 701 OPERATIONS RESEARCH

Module I

Linear Algebra : Review of the properties of matrices and matrix operations, partitioning of matrices, vectors and Euclidean spaces, unit vectors, sum vectors, linear dependence, bases, spanning set, rank, product form of inverse, simultaneous equations, basic solutions, point sets, lines and hyper planes, convex sets, extreme points, fundamental theorem of linear programming.

Module II

Linear Programming : Fundamentals Theorems of Linear programming, Mathematical formulation of the problem, Assumption of Linear programming, graphical Method. Simplex Method – Slack & surplus variables, basic feasible solution, reduction of a feasible solution to basic feasible solution, artificial variables, optimality conditions. Charnes 'M'Method, two phase method.

Module III

Transportation Problems : Definition of a transportation model, North-west Corner Rule, Least Cost or Matrix Minima Method, Vogel's approximation method, Degeneracy in Transportation problem.

Assignment Problems

Theorems of Assignment problem, Zero assignments, Unbalanced problems. Comparison with Transportation Models.

Module IV

Game Theory : Von Neuman's theorem, saddle points, pure and mixed strategies, formulation of primal and dual LP problems for mixed strategies, dominance, graphical solutions. Queueing Theory : Basic structures of queueing models, exponential and poisson distribution, Kendall's Notation, Queueing models – M/M/1 and M/M/K. Simulation : Definition, Simulation Models – Monte-Carlo Simulation, Application of Simulation, Advantages and limitations of Simulation.

Text books

1. Operations Research, Goel and Mittal, Pragti Prakasan, Meerut
2. Operations Research, Kanti Swarup, Gupta and Manmohan, Sultan Chand and Sons Publishers, New Delhi.
3. Operations Research , S Kalavathy , Vikas Publishing House
4. Introduction to operational research , C. R. Kothari Vikas Publishing House
5. Resource Management , N.G. Nair

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 702: VIBRATION AND NOISE CONTROL

Module- I

Introduction to mechanical vibrations: free and forced vibrations, response of single degree of freedom system, viscous damping, coulomb damping, Support excitation, Rotating Unbalance, vibration isolation, whirling of shafts, measurement of vibration, accelerometer and seismometer

Module-II

Response to non sinusoidal excitations and impacts, Multi degree freedom systems, Torsional and longitudinal vibratory system, matrix formulation, eigen value problems, mode shapes, Coordinate Coupling, Lagrange's equations

Module III

Vibration of continuous systems: exact methods, boundary value problem, eigen value problem, axial vibration of rods, transverse vibration of beams, response of system by modal analysis, general elastic waves, approximate methods to analyse system, different methods like Rayleigh's energy method, Rayleigh-Ritz method, Dunkerleys method.

Module IV

Noise, Sound level meter scales, Psychophysical indices, Equivalent sound level, noise and loss of hearing, Measuring hearing, normal hearing and hearing loss, temporary hearing loss from continuous noise, permanent haring loss from continuous noise, physiological effects of noise, effect of noise on performance, general conclusions regarding effects of noise, specific effects of noise, noise exposure limits, continuous and intermittent noise, impulse noise, annoyance of noise, handling noise problems, noise control, control at the source, control at the receiver, control along the path.

TEXT BOOKS

1. Mechanical Vibrations – S. S. Rao, Pearson education
2. Human Factors in engineering and design- Mark S Sanders, Ernest J Mc.Cormick, McGraw Hill series

REFERENCE

1. Theory of Vibrations with applications – W. T. Thomson, CBS Publishers
2. Principles of Vibration – Benson H Tongue, Oxford University Press

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 703: MACHINE DESIGN-II

Module I

Design of Clutches : Friction clutches, uniform wear and uniform pressure assumptions, centrifugal clutches.

Brakes : Design of internal expansion elements, assumptions, design of external contraction elements, band type brakes.

Belt and chain drives : flat belts, V-Belts, roller chain.

Module II

Design of Gears : Spur, helical, bevel and worm gears-tooth loads, design stresses, basic tooth stresses, stress concentration, overload factor, velocity factor, bending strength of gear teeth, Buckingham equation for dynamic load, surface durability, surface strength, heat dissipation, gear material, design for strength and wear, gear box design(description only).

Module III

Bearings and lubrication: types of lubrication, viscosity, journal bearing with perfect lubrication, hydrodynamic theory, design factors, bearing load, bearing dimensions, journal bearing design. Ball and roller bearings- bearing life, static and dynamic capacity, selection of bearings with axial and radial loads, bearing materials used. Thrust bearings, lubrication, wear of metal, adhesive wear, abrasive wear, corrosion wear, fatigue and impact wear, measurement of friction and wear.

Module IV

Product design for manufacturing : general design recommendations for rolled sections, forgings, screw machine parts, turned parts, machined round holes, parts produced on milling machines, welded parts, castings etc., Modification of design for manufacturing easiness for typical products – preparation of working drawings for manufacture of parts with complete specifications including manufacturing details like tolerance, surface finish.

DATA BOOKS ALLOWED FOR EXAMINATION:

1. Mahadevan & Balaveera Reddy : Design Data Hand Book
2. Dr. Linghaigh & Prof. Narayana Iyengar, Vol.1 & 2 : Design Data Hand Book
3. P.S.G. Tech : Design Data Hand Book

TEXT BOOKS:

1. J.E.Shigley : Mechanical engineering design, McGraw Hill
2. James G.Bralia : Handbook of product design for manufacturing, McGraw Hill

REFERENCES

1. Bhandari : Design of machine elements (TMH)
2. V.I.Doughtie : Design of machine elements – McGraw Hill and A. Vallance, International student edition.
3. Siegel, Maleev: Machine design of machines-International and Hartman text book Co.
4. J.Myatt : Machine design, McGraw Hill
5. Sadhu Singh : Machine Design
6. Pandya & Shah: Machine Design

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 704: REFRIGERATION AND AIR CONDITIONING

Module I

Principles of refrigeration-unit of refrigeration - capacity - Coefficient of Performance - refrigeration systems - Carnot refrigeration cycle - steam jet refrigeration - thermoelectric refrigeration - vortex tube - pulse tube - air refrigeration cycle boot strap & boot strap evaporating cooling - thermodynamic analysis of Bell-Coleman cycle

Module II

Vapour compression system - theoretical and practical cycles - simple and multi pressure systems - thermodynamic analysis - vapour absorption system - principle of operation of aqua - ammonia and lithium bromide - water systems - Electrolux system - comparison between vapour compression and absorption systems - refrigerants - thermodynamic, physical and chemical properties of refrigerants - selection criteria of refrigerants

Module III

System components - compressors - reciprocating compressors - single and multistage compressors - work of compression - effect of clearance - effect of inter cooling - optimum pressure ratio - efficiencies - rotary compressors - screw type and vane type compressors - hermetic, semi hermetic and open compressors - condensers - water cooled and air cooled condensers - evaporative condensers - expansion devices - capillary tube - constant pressure expansion valve - thermostatic expansion valve - float valves - evaporators - natural convection and forced convection coils - flooded evaporators - direct expansion coils

Module IV

Psychrometry - Psychrometric properties and processes - determination of air entering conditioned space - air conditioning systems – Summer and Winter air conditioning systems - central and unitary systems - human comfort - comfort chart and limitations - effective temperature - factors governing effective temperature.
Cooling Load Calculation - various heat sources - Solar load - equipment load - infiltration air load - fan load - design of air conditioning systems - duct design - air distribution systems - heating systems

TEXT BOOKS

Dossat, Refrigeration and Air Conditioning
Stoecker, Refrigeration and Air Conditioning, Tata McGraw Hill

REFERENCE BOOKS

Jordan & Priester, Refrigeration and Air Conditioning, Prentice Hall.
Arora, Refrigeration and Air Conditioning, Tata McGraw Hill.
Norman Harris, Modern Air Conditioning Practice, McGraw Hill.

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 705(A): AEROSPACE ENGINEERING

Module I

The atmosphere: characteristics of troposphere, thermosphere, ionosphere, pressure – temperature- density variations in the international standard atmosphere, correction of charts, The standard atmosphere.

Review of basic fluid dynamics**:** continuity, momentum, and energy equations for compressible and incompressible flows, static, dynamic and stagnation pressure, stagnation enthalpy, temperature

Module II

Aerodynamics: 2D viscous flow over bodies, 2D airfoils, nomenclature and classification, pressure distribution in viscid and real flows, circulation theory of air foils, centre of pressure and aerodynamic centre, 2D air foil characteristics, aspect ratio, induced drag, calculation of induced drag from momentum considerations, skin friction and form drag – Drag divergence - Propellers - Blade element theory, propeller coefficients and charts.

Module III

Aircraft performance**:** flight envelops, v-n diagrams for maneuvers, straight and level flight, gliding and climbing, rate of climb, service and absolute ceilings, gliding angle and speed of flattest glider take off, landing performance and length of run way required, range and endurance of aero planes, charts for piston and jet engine aircraft, aircraft instruments - Qualitative ideas of Stability.

Module IV

Aircraft engines: thrust equations- thrust power, propulsive power, propulsive efficiency, principle of turbo jet engines, engine performance characteristics – Rocket engines

Principles of wind tunnel testing: open and closed types of wind tunnels, wind tunnel balances, pressure and velocity measurements, supersonic wind tunnels.

Note: *Standard Atmospheric tables permitted in the exam hall.*

TEXT BOOKS

1. Introduction to flight : John D Anderson, McGraw Hill
2. Mechanics of flight : A C Kermode, Pearson Education

REFERENCE

1. Aircraft performance selection & Design : Francis J Hale, John Wiley & Sons
2. Aero dynamics for Engg. Students : Houghton & Brock
3. Aerodynamics : MAV Piercy
4. Aerodynamics : Dommesch

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

705 (B) FINITE ELEMENT METHOD

Module I

Linear vector spaces- Linear transformations and functionals- linear, bilinear and quadratic forms- theory of normed spaces- theory of inner products spaces- concepts from variational calculus- variational methods of approximation- Ritz method- weighted residual method- Galerkin method- subdomain method-collocation method

Module II

Finite element analysis of one dimensional problems- procedure- I-D elements and interpolation functions- analysis of one dimensional second and fourth order equations- approximation errors in FEM- computer implementation

Module III

Finite element analysis of two dimensional problems- 2-D elements and interpolation functions- 2^{nd} order equations involving a scalar valued function- comments on mesh generation and composition of boundary condition- analysis of plane elasticity and incompressible fluid flow problems- time dependent problems transient heat transfer)- isoparametric elements and numerical integration

Module IV

Alternative formulations- the least square formulations- the mixed formulation- eigen value problem- non linear problems- 3-D elements and interpolation functions- formulation of 3-D problems (2 & 3-D Navier Stokes equations, 3D heat transfer equations)

TEXT BOOKS

1. Reddy J. N, An Introduction to Finite Element Method, McGraw Hill, International edition
2. Reddy J. N, Applied Functional Analysis and Variational Methods in Engineering, McGraw Hill, International edition

REFERENCE

1. Zenkiewicz O, Finite Element Method, McGraw Hill, International edition
2. Huebner K. H., The Finite Element Method for Engineers, John Wiley

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME705 (C) ADVANCED ENGINEERNG MATERIALS

Module I

Introduction - classification and characteristics of polymer matrix and metal matrix composites - mechanical behaviour of UD composites - longitudinal strength and stiffness - transverse strength and stiffness - failure modes - short fibre composites

Module II

Manufacturing and testing methods - production of various fibres - matrix materials and surface treatments - fabrication of composites - fabrication of thermosetting resin matrix composites - fabrication of thermoplastic-resin matrix composites/short fibre composites - fabrication of metal matrix composites - fabrication of ceramic matrix composites - carbon-carbon composites - machining aspects of composites - experimental characterisation of composites - uniaxial tension - compression and shear tests - determination of interlaminar and fracture toughness - damage identification through non-destructive evaluation techniques - ultrasonic, acoustic emission and X-radiography

Module III

Analysis of orthotropic lamina - Hooke's law for orthotropic materials - stress-strain relations and engineering constants - specially orthotropic lamina - relation between engineering constants and elements of stiffness and compliance matrices - restrictions on elastic constants - stress-strain relationships for generally orthotropic lamina - transformation of engineering constants - strengths of orthotropic lamina - typical design application examples

Module IV

Analysis of laminated composites - strain and stress variation in a laminate - synthesis of stiffness matrix construction and properties of special laminates - symmetric laminates - unidirectional, cross-ply and angle-ply laminates - quasi-isotropic laminates - determination of laminae stresses and strains - laminate analysis through computers - typical design application examples

REFERENCE BOOKS

Agarwal B.D. & Broutman L.J., Analysis and Performance of Fiber Composites, John Wiley
Gibson R.F., Principle of Composite Material Mechanics, McGraw Hill
Schwartz M.M., Composite Materials Handbook, McGraw Hill, Inc.
Jones R.M., Mechanics of Composite Materials, McGraw Hill, Inc.
Tsai S.W., Introduction to Composite Materials, Technomic Publishing Company
Chawla K.K., Ceramic Matrix Composites, Chapman & Hall

REFERENCE BOOKS

Agarwal B.D. & Broutman L.J., *Analysis and Performance of Fiber Composites*, John Wiley
Gibson R.F., *Principle of Composite Material Mechanics*, McGraw Hill
Schwartz M.M., *Composite Materials Handbook*, McGraw Hill, Inc.
Jones R.M., *Mechanics of Composite Materials*, McGraw Hill, Inc.
Chawla K.K., *Ceramic Matrix Composites*, Chapman & Hall
Tsai S.W., *Introduction to Composite Materials*, Technomic Publishing Company

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 705 (D) QUALITY ENGINEERING

Module I (9Hours)

Fundamentals of the theory of probability: objectives and applications; variable and attributes, fundamentals concepts; patterns of variation, frequency distribution; cells and cell boundaries, cumulative frequency distribution, the normal distribution, average, measure of dispersion, statistical concept of universe.

Binomial distribution, mean and standard deviation, Poisson distribution as an approximation to the binomial, use of tables for solving Poisson problems.

Module II (10 Hours)

Shewhart's control charts for variables: X bar and **R** charts, relationship between sample parameters and universe parameters, control limits for **X bar** and **R** charts, examples of processes in control, examples of processes out of control, process capability

Control chart for fraction defective: necessary steps for selection of sub groups, choice between **p** chart and **np** chart, control limits, charts showing control and lack of control, sensitivity of the **p** chart.

Control charts for defects: control limits for **c** charts; preparation and use of **c** charts.

Module III(10 Hours)

Acceptance sampling : lot by lot acceptance using single sampling by attributes, operating characteristics curves, producer's risk, consumer's risk, AOQL, LTPD, quality protection, selection of sampling plans, choice of sampling plans to minimize average total inspection, ATI curves, double and sequential sampling plans, concept of AQL

Module IV (10 Hours)

Life testing and reliability: concept & definition of reliability, analysis of life test, failure distribution- probability of equipment failure, conventional model, failure rate, MTBF, OC curves ,exponential reliability function, series, parallel, and combinational reliability, redundant system, maintainability, and availability.

REFERENCE:

1) E.L.Grant : Statistical Quality Control, (McGraw Hill)
2) L.S. Srinath : Reliability Engineering
3) Mahajan : Statistical Quality Control

Note : SQC tables to be permitted in the examination hall.

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 706 HEAT & MASS TRANSFER LABORATORY

Introduction to fundamentals of heat transfer - condensation and boiling heat exchanges experimental techniques in thermal sciences

Practicals

1. Performance studies on a shell and tube heat exchanger
2. Performance studies on parallel and counter flow arrangements in a concentric pipe heat
3. exchanger
4. Emissivity measurement of a radiating surface
5. Measurement of solar radiation
6. Thermal conductivity of a metal rod
7. Measurement of unsteady state conduction heat transfer
8. Experimental study on forced convection heat transfer
9. Experimental study of dropwise and flimwise condensation
10. Experiments on boiling heat transfer
11. Measurement of critical heat flux.

Note: 50% Marks is earmarked for continuous evaluation and 50% marks for end semester examination to be assessed by two examiners. A candidate shall secure a minimum of 50% marks separately for the two components to be eligible for a pass in that subject.

ME 707 CAD/CAM LAB

1. Use of CAD/CAM software packages like I-DEAS, Pro engineer, Unigraphics, CATIA, ANSYS etc.
2. Use of project management software like PRIMAVERA
3. Maintenance of PC and peripherals
4. Operation of CNC milling machine and CNC Lathe
5. Manual part programming exercises (editing and simulation)
6. Part programming using APT or APT like languages
7. Operation of Robots
8. Programming of Robots
9. Operation Coordinate Measuring Machine.

Note: 50% Marks is earmarked for continuous evaluation and 50% marks for end semester examination to be assessed by two examiners. A candidate shall secure a minimum of 50% marks separately for the two components to be eligible for a pass in that subject.

ME708 SEMINAR

Students shall individually prepare and submit a seminar report on a topic of current relevance related to the field of Mechanical Engineering. The reference shall include standard journals, conference proceedings, reputed magazines and textbooks, technical reports and URLs. The references shall be incorporated in the report following International standards reflecting the state-of-the-art in the topic selected. Each student shall present a seminar for about 30 minutes duration on the selected topic. The report and presentation shall be evaluated by a team of internal experts comprising of 3 teachers based on style of presentation, technical content, adequacy of references, depth of knowledge and overall quality of the seminar report.

ME 709 PROJECT DESIGN

Each batch comprising of 4 to 6 students shall identify a project related to the curriculum of study. At the end of the semester, each student shall submit a project synopsis comprising of the following.

- Application and feasibility of the project
- Complete and detailed design specifications.
- Block level design documentation
- Detailed design documentation including block/line diagrams and algorithms
- Project implementation action plan using standard presentation tools

Guidelines for evaluation:

i)	Attendance and Regularity	10
ii)	Quality and adequacy of design documentation	10
iii)	Concepts and completeness of design	10
iv)	Theoretical knowledge and individual involvement	10
v)	Quality and contents of project synopsis	10
	Total	50 Marks

Note: *Points (i)-(iii) to be evaluated by the respective project guides and project coordinator based on continuous evaluation. (iv)-(v) to be evaluated by the final evaluation team comprising of 3 internal examiners including the project guide.*

ME 801 OPERATIONS MANAGEMENT

Module I

Network techniques: Basic concept of network constructing, information requirement, critical path, algorithm for critical path, various slacks, crashing, multi-time estimate, PERT, the short root problem, the minimal spanning tree problem, maximal flow in capacitated network.
Forecasting: methods of forecasting time series, moving average method, exponential smoothening.

Module II

Production planning and control: Scopes and objectives Functions of production planning and control, product consumption cycle, product life cycle, design function, product design, cost factors, simplification, standardization, specialisation, inter-changeability.
Inventory control: Structure of inventory problems, relevant cost, EOQ models, infinite delivery rate without backordering, stores ledger, materials requisition sheet, materials return note, material transfer note, bin cards.

Module III

Agregate Planning methods: graphical and reaction rate methods.
Scheduling: Gantt charts, indexing methods, Basic concepts of sequencing, one machine n jobs, 2 machine n jobs, m machine n jobs problems, critical ratio method of loading & scheduling Despatching, progress reporting and expediting functions.
3

Module IV

Plant Location and Layout: Factors influencing location, need for layout, layout design process, determination of equipment and employee requirement, production rate determination, space determination, block plan, systematic layout planning.
Material handling: The principles of materials handling, classification, selection factors.
Maintenance & replacement: preventive and breakdown maintenance, economic aspects, replacement of equipment, depreciation.

TEXT BOOKS AND REFERENCES

1. James L.Riggs : Economic decision models for engineers and managers- McGraw Hill ISE.
2. Hiller & Liberman : Introduction to Operations Research – Holden Day Inc. San Francisco
3. Wiest & Levy : A management guide to PERT and CPM – Prentice Hall Of India
4. Starr & Miller : Inventory control – Theory & Practice – Prentice Hall India.
5. Sammuel Eilon : Production planning and control – universal book corporation, Bombay.
6. Biegel : Production control – Prentice hall of India.
7. Francis & White : Facility layout and location – Prentice hall Inc.
8. Moore : Plant layout and Design – The Macmillian Company, New York
9. Barnes R.M. : Time and motion study – Asia publication.
10. Miller & Blood : Modern maintenance management
11. Plant engg hand book : McGraw Hill
12. Kanishka Bedi : Production & Operations Management-Oxford University Press

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 802: COMPRESSIBLE FLUID FLOW

Module I

Introduction to gas dynamics : system, and control volume approach, conservation of mass, continuity equation, conservation of energy, steady flow energy equation, entropy changes in fluid flow, stagnation state, sonic velocity, mach number, classification of fluid flow based on mach number, Mach cone.

Effects of area variation on one dimensional compressible flow: isentropic flow of an ideal gas, basic equation, reference conditions for isentropic flow of an ideal gas, mass flow, and chocking, isentropic flow in converging nozzle, coefficient of velocity.

Module II

Flow with Normal Shock Waves: Fundamental equation for normal shock, normal shock equation for a perfect gas, Prandtl relation for normal shock, tables for computation of normal shock, normal shock on T-S diagram.

Flow with Oblique Shock waves: Fundamental Relations, Prandtl's equation, Rankine-Hugoniot equation, Variation of flow parameters, Mach Waves.

Module III

Effects of friction in one dimensional flow : Adiabatic flow in constant area duct with friction, fanno line, fanno relation for perfect gas, tables for computation of fanno flow, chocking resulting from friction.

Effects of heat exchange in one dimensional flow : frictionless flow in constant area duct with heat transfer, Raleigh line, Rayleigh equations for a perfect gas, tables for computation of rayleigh flow, chocking resulting from heat transfer.

Module IV

Methods of flow measurement and flow visualization : pressure probes, Prandtl probe, pitot tube, Prandtl pitot static tube, Supersonic pitot tube, 3 Shock tube.

Rayleigh supersonic pitot formula, temperature recovery factor, hot wire anemometer, working principles of shadow graph, Velocimeter, schlieren apparatus and interferometer. Wind Tunnels – Subsonic and Supersonic Wind tunnels.

TEXT BOOKS

1. Dynamics and thermodynamics of compressible fluid flow : Shapiro
2. Compressible fluid flow : Patrick H. Oosthuizen, McGraw Hill

REFERENCE

1. Gas dynamics : Cambell & Jannings
2. Gas dynamics : Yahya

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 803 PRODUCTION TECHNOLOGY

Module I

Kinematics of Machine Tools: Selection of range of speeds and feeds, layout of speeds, graphical representation of speed and structural diagrams, ray diagrams for machine tool gear boxes, speed chart, speed box design, feed chart, feed box design, gearing diagram, stepped and step less regulation of speeds, feed and speed mechanisms in lathe, milling and drilling machines.

Module II

Non-traditional machining processes: Principles, machining unit, process characteristics and applications of Electro Discharge Machining, Electro Chemical Machining, Abrasive Jet Machining, Ultrasonic Machining, Electron Beam Machining, Laser Beam Machining, and Plasma Arc Machining-capability analysis of non traditional processes.

Module III

Powder Metallurgy: Definition and basic concept of the powder metallurgy process, powder manufacture, characteristics of metal powders, mixing and blending, compacting, pre-sintering, sintering, hot pressing, secondary P/M operations like infiltration, impregnation, sizing, properties of P/M products, product applications, advantages & disadvantages.

Module IV

Hydraulic operation of Machine Tools: Elementary ideas of fluidics-classification of fluidic elements, types of fluid logic elements, logic states, circuits, hydraulic valves, flow, pressure and direction control valves, JIC symbols, elementary control circuits, oil hydraulic circuits of shaping, drilling and grinding machines.

Estimation and Costing: estimation and costing in foundry shop, sheet metal shop, welding shop, and machine shop- simple examples in lathe, drilling, milling, shaping and grinding machines.

REFERENCES

1. Boothroyd : Fundamentals of Metal Machining and Machine Tools
2. Sen & Battacharya : Principles of Machine tools- New central book agency, Culcutta
3. N K Mehta : Machine tool design & Numerical control
4. Sharma : A text book of production engineering (S Chand & Co)
5. Dalela : Manufacturing Science & Technology Vol II (Ummesh Publication)
6. Pandey & Shah : Modern machining processes (Tata McGraw Hill)
7. Koeingberg : Machining Science & their application (Pergamon Press)
8. Jones : Production Engineering (Jig and Tool Design)
9. Donaldson : Tool Design, Mc Graw Hill
10. ASTME : Fundamentals of Tool Design
11. B.J. Ranganath : Metal Cutting and Tool Design, Vikas Publishing House

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 804(A): PROPULSION ENGINEERING

Module I

Fundamentals of propulsion: Types of propulsive devices - Turbo prop, Turbo jet, Turbo fan, Turbo shaft, Ram jet, Scramjet, Pulse jet, Ram rocket, Comparative study of performance characteristics, Propellers, Advance ratio, Types of combustion chambers, Operating characteristics, Fuel injection in combustion chamber, Factors limiting turbine design, materials for turbine blades, cooling of turbine blades, Surging in compressors and its control, comparison of centrifugal and axial flow compressors

Module II

Thrust equation, Calculation of thrust and thrust power, propulsive efficiency, thermal efficiency, transmission efficiency, and overall efficiency of turbo jet engines, isentropic flow through nozzles, Thrust Augmentation methods, Analysis of turbo jet engine cycle, Component efficiencies, Diffuser efficiency, Compressor efficiency, Burner efficiency, Turbine efficiency, Nozzle efficiency, Velocity coefficient, Performance characteristics of a turbo jet engine, Analysis of Turboprop, Turbofan and Ramjet engine cycles.

Module III

Rocket Propulsion: General operating principles of rocket motors, performance parameters for rocket motors and their relationship, Rocket equation, Burn out velocity, Specific Impulse, Specific Propellant Consumption, Characteristic Velocity, Thrust Vector Control, Altitude gain, Solid propellant Rocket motor, Grain configuration, Propellant area ratio, Liquid propellant Rocket engines, Gas pressure feed systems, Turbo-pump feed system, Injectors, Hybrid rockets, Nuclear, Solar and Electrical rockets.

Module IV

Liquid fuels, Liquid Oxidizers, Liquid monopropellants, Cryogenic fluids as rocket propellants, Properties of cryogenic rocket propellants, Cryogenic rocket engine, Manufacture of cryogenic fluids, Igniters – Pyrotechnic & Pyrogen Igniters, Combustion instability, Cooling of Thrust Chambers – Radiation cooling, Ablative cooling, Regenerative cooling, Film cooling, Transpiration cooling, Aspects of Launching, Boost dynamics, Orbit equation, Space vehicle trajectories, Kepler's Law, Atmospheric Re-entry of Space vehicles.

Note: *Gas tables are permitted in the exam hall.*

TEXT BOOKS

1. Air craft and missile propulsion : Zucrow, D Van Nostrand Company
2. Rocket Propulsion Elements : G P Sutton, John Wiley & Sons

REFERENCE:

1. Propulsion Systems : Hosny
2. Aircraft Gas Turbine engine technology :Treager, TMH
3. Gas Turbine Theory : Cohen & Rogers, Pearson
4. Gas Turbines & Jet and Rocket Propulsion : Mathur & Sharma, Standard Pub.
5. Fundamentals of Compressible Flow : Yahya, New Age International.

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 804(B): COMPUTATIONAL FLUID DYNAMICS

Module-I

Classification of partial differential equations – system of first and second order partial differential equations – initial and boundary conditions – finite difference formulations – finite difference equations – finite difference approximation of mixed partial derivatives.

Module-II

Parabolic partial differential equations – explicit methods – implicit methods – parabolic equation in two space dimensions – consistency, stability and error analysis of finite difference equations – artificial viscosity.

Module-III

Elliptic equations – finite difference formulations – solution algorithms – finite difference formulations – splitting methods – multiple step methods.

Module-IV

Scalar representation of the Navier-Stokes equations – model equations – numerical algorithms – incompressible Navier-Stokes equation – primitive variable and vorticity - stream function formulations – Poisson equation for pressure – numerical algorithms – boundary conditions – staggered grids.

TEXT BOOKS

1. Computational Fluid Dynamics, Anderson
2. Computational Fluid Dynamics for Engineers, Hoffmann Klaus

REFERENCE

1. Computational Fluid Flow and Heat Transfer, Sundararajn & Muralidhar, Narosa.
2. Computational Technique for Fluid Dynamics, Fletcher, Springer Verlag
3. Numerical Heat Transfer and Fluid Flow, Patankar Suhas

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 804 (C) MATERIALS MANAGEMENT

Modue I

Introduction: Scope, objectives and phases in materials management,

Procurement: purchase procedure, tender, earnest money, security deposit, purchase order, vendor rating.

Receipt: Invoice, cash memo, inspection. **Storage:** methods of storage.

Selective control techniques of inventory – ABC & VED analysis.

Inventory Theory: objectives of keeping inventory, structure of inventory problems and their analysis, relevant cost.

Module II

Static inventory problems under risk : general characteristics, Christmas tree problem, total cost matrix, opportunity cost matrix, cost of risk, mathematical formulation of discrete and continuous cases.

Dynamic inventory problems under certainty: general characteristics, optimal lot size models with constant demand and infinite delivery rate with and without back ordering, quantity discounts

Module III

Dynamic inventory problems under risk: general characteristics, basic kinds of inventory control systems – demand probability distribution – approximate methods to find optimal P & Q systems of inventory, optimal selling policy with fluctuating prices.

Module IV

Material requirement planning: master production schedule, bill of materials, inventory stock, files, MRP process, logic and computational procedure using simple example, lot sizing in MRP

TEXT BOOK AND REFERENCES

1. A.Deb : Materilas Management-Academic Publishers, Calcutta, India.
2. Starr & Miller : Inventory control – theory and practive – Prentice Hall of India.
3. Operations Management : G Monks, Mc Graw Hill
4. Kanishka Bedi:Production & Operations Management-Oxford University Press

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 804 (D) ADVANCED PRODUCTION TECHNOLOGY

Module I

Classification of Machine tools, Generation and forming, Methods of generating surfaces- Accuracy and finish Achievable, Basic elements of machine tools, Support structures, Guide ways, general work holding methods.

Module II

Abrasive process, introduction, Grinding wheel designation and selection, Types of grinding machines, Grinding process, Grinding process parameters, creep feed grinding, Honing, lapping, other finishing process. Machine tool testing, Introduction, measuring instruments used for testing, Test procedures, Acceptance tests. General guidelines for Designing for machining

Module III

Press work operations-presses for sheet metal working, constructional features-die cutting operations-die/punch size estimation, scrap-strip layout-centre of pressure and press tonnage-compound and progressive dies

Module IV

Process planning, product cycle in manufacturing, product quality, part print analysis, location principles, tolerance stacking, errors in machining, operation selection, tolerance analysis, computer aided process planning.

REFERENCE:

1) M.C. Shaw, Metal Cutting Principles, Oxford University Press 1982
2) Geoffry Boothroyd , Fundamental of metal machining and machine tools, Tata McGraw Hill
3) P.N. Rao, Manufacturing Technology, Tata McGraw Hill Publishing Company Limited
4) ASTME , Fundamentals of Tool Design, Prentice Hall of India
5). Mullick & Bhattacharya , Technology of Machining Systems, New Central Book Agency

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

ME 804 (E) AUTOMOBILE ENGINEERING

Module I

Power Plant: Automotive engine classification, S.I. & C.I. engines, combustion chamber types, engine balancing, multi cylinder arrangements. **Automobile engine parts**: Cylinder block, cylinder head, crank case, oil pan, cylinder liners, piston, arrangements to control piston slap, piston rings, connecting rod, crank shaft, valves, valves actuating mechanism, valves lay out, materials used, valve and port timing diagrams.

Module II

Fuel supply system: Simple carburetor, constant choke, constant vacuum carburetor, types of carburetor, mixture strength requirements, fuel pumps for petrol engines, petrol injections, MPFI systems, diesel fuel pump and fuel injector for diesel engines. **Ignition System:** Battery ignition system, comparisons between battery ignition and magnetic ignition system, ignition advance methods, electronic ignition. **Cooling System:** Necessity, methods of cooling. **Lubrication System:** Objectives, system of engine lubrication, crank case ventilation

Module III

Chassis construction: The frame and its functions, unitary or frameless, Layout of the components of transmission system **Clutches:** Purpose, requirements, construction details **Gear box:** sliding mesh gear box, constant mesh gear box, synchro mesh gear box, epicyclic gear box, overdrive, torque converter, automatic transmission an overview,

Module IV

Universal coupling, propeller shaft, final drive Steering mechanisms, wheel suspension. Factors for wheel alignment**:** camber, caster, kingpin inclination, toe–in, toe–out **Brakes:** Types of brakes, Braking requirements, brake efficiency, stopping distance, fading of brakes

Electrical equipments

REFERENCE:

1) Newton, steed and Garette: "Motor Vehicle", Butter worth 2nd Ed., 1989.
2) Kirpal singh "Automobile Engineering" Vol-I & Vol-II Standard Publishers Distributors.
3) Heitner Joseph, "Automotive mechanics" East west press
4) Crouse "Automotive mechanics" McGraw Hill book Co.
5) N.K. Giri "Automobile mechanics" Khanna publishers 7th Ed., 1996.

Type of questions for University Examination
Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module
Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

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ME 805 PROJECT

Each batch of students shall develop the project designed during the VII semester. The implementation phase shall proceed as follows:

- A detailed project report in the prescribed format shall be submitted at the end of the semester. All test results and relevant design and engineering documentation shall be included in the report.
- The work shall be reviewed and evaluated periodically

The final evaluation of the project shall be done by a team of minimum 3 internal examiners including the project guide and shall include the following.

- Presentation of the work
- Oral examination
- Demonstration of the project against design specifications
- Quality and content of the project report

Guidelines for evaluation:

Regularity and progress of work		30
Work knowledge and Involvement		100
End semester presentation and oral examination		50
Level of completion and demonstration of functionality/specifications		70
Project Report – Presentation style and content		50
	Total	300 marks

Note: *Points (i) and (ii) to be evaluated by the respective project guide and the project coordinator based on continuous evaluation. (iii)-(v) to be evaluated by the final evaluation team comprising of 3 internal examiners including the project guide.*

ME 806 VIVA - VOCE

Each student is required to appear for a viva-voce examination at the end of the complete course work. The students shall produce the seminar report and project reports duly attested by the institutional authorities, before the examiners. The examination panel shall comprise of one internal examiner and one external examiner, both appointed by the University. The examiners shall evaluate the students in terms of their conceptual grasp of the course of study and practical/analysis skills in the field.