B.TECH DEGREE COURSE IN MECHANICAL ENGINEERING

(2012 Admissions)

SCHEME OF EXAMINATIONS

B.TECH DEGREE COURSE IN MECHANICAL ENGINEERING

Scheme of Examinations (2012 admissions)

SEMESTER I&II (Common to all branches)

Code No.	Subject	L Hrs/ Wk	T Hrs/ Wk	P Hrs/ Wk	C	Int.	Univ.	Total
1101	Engineering Mathematics –I	2	1		4	50	100	150
1102	Engineering Physics	3			4	50	100	150
1103	Engineering Chemistry	3			4	50	100	150
1104	Engineering Mechanics	3	1		5	50	100	150
1105	Engineering Graphics	1	-	3	5	50	100	150
1106	Basic Civil and Mechanical Engineering	2			4	50	100	150
1107	Basic Electrical and Electronics Engineering	2			4	50	100	150
1108	Computer Programming	1			4	50	100	150
1109	Environmental Studies and Technical Communication	2*			3	50	100	150
11 L1	Electrical and Mechanical Workshops	-	-	3	4	100	-	100
11 L2	Computer Programming Laboratory	-	-	2	2	100	-	100
11 L3	Language Laboratory	-	-	1	1	100	-	100
	TOTAL	**19**	**2**	**9**	**44**			

* 1 hour / week each for Environmental Studies and Technical Communication.

SEMESTER III

Code No.	Subject	L Hrs/ Wk	T Hrs/ Wk	P Hrs/ Wk	C	Int.	Univ.	Total
CE/CS/EB/EC/EE/EI/FT/IT/ME/SE 1301	Engineering Mathematics II	3	1	0	3	50	100	150
ME 1302	Electrical Technology	3	1	0	3	50	100	150
ME 1303	Mechanics of Solids	3	1	0	3	50	100	150
ME 1304	Fluid Mechanics	3	1	0	3	50	100	150
ME 1305	Metallurgy & Materials Science	3	1	0	3	50	100	150
ME 1306	Machine Drawing	1	0	3	3	50	100	150
ME 13 L1	Strength of Materials Lab	0	0	3	2	100	-	100
ME 13 L2	Fluid Mechanics Lab	0	0	3	2	100	-	100
	TOTAL	**16**	**5**	**9**	**22**			

SEMESTER IV

Code No.	Subject	L Hrs/ Wk	T Hrs/ Wk	P Hrs/ Wk	C	Int.	Univ.	Total
CE/CS/EB/EC/EE/EI/FT/IT/ME/SE 1401	Engineering Mathematics III	3	1	0	3	50	100	150
ME 1402	Metrology & Instrumentation	3	1	0	3	50	100	150
ME 1403	Mechatronics	3	1	0	3	50	100	150
ME 1404	Applied Thermodynamics	3	1	0	3	50	100	150
ME 1405	Hydraulic Machinery	3	1	0	3	50	100	150
ME 1406	Manufacturing Process	3	1	0	3	50	100	150
ME 14 L1	Electrical Machines Lab	0	0	3	2	100	-	100
ME 14 L2	Hydraulic Machinery Lab	0	0	3	2	100	-	100
	TOTAL	**18**	**6**	**6**	**22**			

SEMESTER V

Code No.	Subject	L Hrs/ Wk	T Hrs/ Wk	P Hrs/ Wk	C	Int.	Univ.	Total
CE/CS/EB/EC/EE/EI/FT/IT/ME/SE 1501	Engineering Mathematics IV	3	1	0	3	50	100	150
ME 1502	Mechanics of Machinery	3	1	0	3	50	100	150
ME 1503	Machine Tools & Machining Science	3	1	0	3	50	100	150
ME 1504	Thermal Engineering	3	1	0	3	50	100	150
ME 1505	Industrial Management	3	1	0	3	50	100	150
ME 1506	Power Plant Engineering	3	1	0	3	50	100	150
ME 15 L1	Computational Methods Lab	0	0	3	2	100	-	100
ME 15 L2	Machine Shop	0	0	3	2	100	-	100
	TOTAL	**18**	**6**	**6**	**22**			

SEMESTER VI

Code No.	Subject	L Hrs/ Wk	T Hrs/ Wk	P Hrs/ Wk	C	Int.	Univ.	Total
ME 1601	Dynamics of machinery	3	1	0	3	50	100	150
ME 1602	Machine Design – I	3	1	0	3	50	100	150
ME 1603	Operations Management	3	1	0	3	50	100	150
ME 1604	Heat & Mass transfer	3	1	0	3	50	100	150
ME 1605	CAD/CAM	3	1	0	3	50	100	150
ME 1606 E	Elective – I	3	1	0	3	50	100	150
ME 16 L1	CAD/CAM Lab	0	0	3	2	100	-	100
ME 16 L2	Thermal Engineering Lab	0	0	3	2	100	-	100
	TOTAL	**18**	**6**	**6**	**22**			

ME 1606 E ELECTIVE –I

E1 Hydraulic and Pneumatic drives
E2 Advanced Mechanics of Solids
E3 Energy Conservation and Environment Protection
E4 Advanced Engineering Materials

SEMESTER VII

Code No.	Subject	L Hrs/ Wk	T Hrs/ Wk	P Hrs/ Wk	C	Int.	Univ.	Total
ME 1701	Refrigeration & Air-conditioning	3	1	0	3	50	100	150
ME 1702	Vibration & Noise Control	3	1	0	3	50	100	150
ME 1703	Machine Design – II	3	1	0	3	50	100	150
ME 1704	Automobile Engineering	3	1	0	3	50	100	150
ME 1705 E	Elective II	3	1	0	3	50	100	150
ME 17L1	Heat and Mass Transfer Lab	0	0	3	2	100	-	100
ME 17L2	Metrology & Measurements Lab	0	0	3	2	100	-	100
ME 17L3	Seminar	0	0	3	2	100	-	100
ME 17L4	Project Design	0	0	1	1	50	-	50
	TOTAL	**15**	**5**	**10**	**22**			

ME 1705 E ELECTIVE-II
E1 Aerospace Engineering
E2 Finite Element Method
E3 Quality Engineering
E4 Mechanical Behaviour of Materials

SEMESTER VIII

Code No.	Subject	L Hrs/ Wk	T Hrs/ Wk	P Hrs/ Wk	C	Int.	Univ.	Total
ME 1801	Compressible Fluid Flow	3	1	0	3	50	100	150
ME 1802	Production Technology	3	1	0	3	50	100	150
ME 1803	Operations Research	3	1	0	3	50	100	150
ME 1804 E	Elective III	3	1	0	3	50	100	150
ME 18L1	Project	0	0	14	8	300	-	300
ME 18L2	Viva voce	0	0	0	2	-	100	100
	TOTAL	**12**	**4**	**14**	**22**			

ME 1804 E ELECTIVE- III
E1 Propulsion Engineering
E2 Materials Management
E3 Computational Fluid Dynamics
E4 Cryogenic Engineering

1101 ENGINEERING MATHEMATICS I

Module I
Ordinary differential equations:

First order differential equations - exact differential equations, Bernoulli's 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 : 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.

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 calculus:
Application of definite integrals: Area, Volume, Arc length, Surface area.
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

References:

1. S.S.Sastry, Engineering Mathematics -Vol1, PHI publishers
2. Erwin Kreyzig, Advanced Engineering Mathematics, Wiley Eastern
3. T.Veerarajan, Engineering Mathematics, TMGH Publishers
4. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers

Type of Questions for University Exam.
Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)
Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

1102 ENGINEERING PHYSICS

Module 1

Laser-introduction--spontaneous and stimulated emission-principle of laser- properties of laser-Einstein coefficients and the analysis of lasing conditions- Basic components of a laser-Different types of lasers-construction,working and applications of Ruby laser-Neodymium YAG laser- He-Ne laser- semiconductor laser-Applications of laser in medicine, industry, science and communication.

Holography-basic principle-Comparison with ordinary photography-Recording and reconstruction of holograms-applications.

Fibre optics - Basic structure of an optical fibre - step-index fibre and graded index fibre- propagation of light in an optical fibre-acceptance angle and acceptance cone- Numerical aperture of a step-index fibre-Numerical aperture of a graded index fibre-modes of propagation-step index monomode fibre-Multimode stepindex fibre- Graded multimode fibre-Attenuation in optic fibres-fibre losses-material loss,scattering loss,absorption loss,leaky modes-dispersion in optical fibres- Applications.

Module II

Crystallography – Space lattice- Basis- Unit cell- Unit cell parameters- Crystal systems- Bravais lattices-Three cubic lattices-sc, bcc, and fcc- Number of atoms per unit cell- Co-ordination number- Atomic radius-Packing factor-Relation between density and crystal lattice constants- Lattice planes and Miller indices-Separation between lattice planes in sc- Bragg's law- Bragg's x-ray spectrometer- Crystal structure analysis.

Liquid crystals- Liquid crystals, display systems-merits and demerits- Metallic glasses- Types of metallic glasses (Metal-metalloid glasses, Metal-metal glasses) – Properties of metallic glasses (Structural, electrical,magnetic and chemical properties).

Shape memory alloys- Shape memory effect, pseudo elasticity

Module III

Introduction to nanoscale science and technology- nanostructures-nanoring, nanorod, nanoparticle, nanoshells- Properties of nanoparticles- optical, electrical, magnetic, mechanical properties and quantum confinement- Classification of nanomaterials- C60, metallic nanocomposites and polymer nanocomposites-Applications of nanotechnology.

Superconductivity-Introduction--transition temperature-Meissner effect-properties of super conductors.Types of superconductors-type 1 and type 2- AC Josephsons effect- DC Jospehsons effect- Flux quantisation-Squid-High temperature superconductors-Applications of super conductivity.

Special Theory of Relativity - Michelson-Morley experiment. Einstein's postulates. Lorentz transformation equations (no derivation). Simultaneity. Length contraction. Time dilation. Velocity addition. Relativistic mass. Mass energy relation. Mass less particle.

Module IV

Quantum mechanics-Introduction-origin of quantum theory-black body radiation and photo electric effect (brief ideas only)-matter waves- wave packet-uncertainty principle-(two forms)Time dependent Shrodinger equation for a free particle-Particle in force field and time dependent Schrodinger equation-Time independent schrodinger equation-Physical intrepretation of wave function-application -Particle in a Box (one dimensional) –Energy eigen values and wave functions **Ultrasonics**-piezo electric effect-Magnetostriction effect-production of ultrasonics-properties of ultrasonics- ultrasonic diffractometer and determination of velocity of ultrasonics in a liquid-Application of ultrasonics in non destructive testing - Accoustics of building-reverberation- Absorption Coefficient-Sabines formula for reverberation time(Derivation)-Accoustic intensity- loudness-decibel-phon-conditions for good acoustics(Qualitative study).

References:

1. S. Mani Naidu, A Text book of Engineering Physics, Pearson, 2010
2. M.C. Santosh Kumar, Engineering Physics, Nalpat Publishers.
3. B. Premlet, Advanced Engineering Physics, Phasor Books, Kollam.
4. A.S. Vasudeva, Modern Engineering Physics, S. Chand & Co.
5. Prabir K. Vasu and Hrishikesh Dhasmana, Engineering Physics, Ane books Pvt. Ltd., 2010.
6. S.O. Pillai & Sivakami, Applied Physics, New Age International (P) Ltd., Second Edition 2008.
7. G.S. Raghuvanshi, Engineering Physics, Prentice Hall of India.

Type of Questions for University Exam

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

1103 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.

Spectroscopy: Molecular energy levels-Types of molecular spectra- Electronic spectra (Classification of electronic transitions- Beer Lamberts law, Vibrational spectra (mechanism of interaction and application), Rotational spectra (Determination of bond length and application). NMR spectra (Basic principle, chemical shift, spin-spin splitting)

Solid surface characterisation: Electron spectroscopy for chemical analysis, Chemical shift, BET isotherm, Thermodynamics of adsorption.

Module II

Electrochemistry: Fundamentals, Electrode potential, Nernst's equation, Types of electrodes, Salt bridge, E.M.F measurement. Concentration cells, Calculation of E.M.F of a concentration cell.

Acids and bases, Arrhenius concept, Bronsted-Lowry concept of acids and bases, Lewis concept, Buffer solutions, pH measurement, Polarisation, Overvoltage.

Power generation: Secondary cells, Fuel cells, Photovoltaic effect, Solar cells.

Corrosion and its control: Theories of corrosion - Galvanic series- Types of corrosion - Factors affecting corrosion and different methods of corrosion control.

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.

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.

Phase Rule: Terms involved in phase rule and examples, Application of phase rule to one component water system, Application of phase rule to two-component systems.

Module IV

Engineering materials:

Polymers- Classifications- Mechanism of polymerisation (Addition, free radical, cationic, anionic and coordination polymerisation)- Thermoplastics and thermosetting plastics-Compounding of plastics-Moulding techniques of plastics (Compression, Injection, Transfer and Extrusion moulding)-Preparation, properties and uses of PVC, PVA, Nylon, PET - Silicon polymers- Biodegradable plastics. Elastomers- structure of natural rubber- vulcanisation- synthetic rubbers (Buna-S, Butyl rubber and Neoprene).

Lubricants- Introduction-Mechanism of lubrication- solid and liquid lubricant- Properties of lubricants-Viscosity index- flash and fire point- cloud and pour point- aniline value.

Refractories: Classification – Properties of refractories.

Cement- Manufacture of Portland cement- Theory of setting and hardening of cement.

References:

1. Peter Atkins, Julio de Paula, Elements of Physical Chemistry, Oxford University Press, 2005.
2. John E. McMurry and Robert C. Fay, Chemistry, 5th Edition, Pearson, 2008.
3. O. G Palanna, Engineering Chemistry, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2009.
4. R.N. Goyal, Harmendra Goel, Textbook of Engineering Chemistry, 2nd Edition, Ane Books Pvt. Ltd., 2011.
5. R Gopalan, D Venkappayya, Sulochana Nagarajan, Textbook of Engineering Chemistry, 2nd Edition, Vikas Publishing House Pvt. Ltd., New Delhi, 2005.
6. Shashi Chawla, A Text Book of Engineering Chemistry, Dhanpat Rai & Co, New Delhi, 2003.
7. Kochubaby Manjooran, Modern Engineering Chemistry, Kannantheri Publication, Kochi.

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

1104 ENGINEERING MECHANICS

1. **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.

2. **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.

References:

1. Timoshenko and Young, Engineering Mechanics, McGraw Hill Book Company.
2. Beer F. P. and Johnston E. R, Mechanics for Engineers (Vol. 1- Statics and Vol.2 -Dynamics), Tata McGraw Hill.
3. Merriam H. L. & Kraige L. G, Engineering Mechanics (Vol. 1- Statics and Vol.2 -Dynamics), John Wiley and Sons.
4. Biju N, Engineering mechanics, Educational Publications.

Type of Questions for University Exam

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

1105 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.

References:

1. K.C. John. Engineering Graphics, PHI Learning
2. P.I. Varghese and K.C. John, Engineering Graphics, JET Publishers
3. N.D.Bhat , Elementary Engineering Drawing, Charotar publishing house
4. P.S.Gill , Geometric Drawing, B.D Kataria &Sons, Ludhiana
5. P I Varghese , Engineering Graphics, VIP Publishers.

University Examination Question Paper pattern

Two questions of 20 marks each from all the five modules. Answer one question from each module. (5x20 = 100 marks)

1106 BASIC CIVIL AND MECHANICAL ENGINEERING

PART- A: BASIC CIVIL ENGINEERING

Module I

Engineering Materials: Cement - varieties and grade of cement and its uses. Cement mortar- Steel- types of steel for reinforcement bars, steel structural sections. Brick- varieties and strength, tests on bricks.

Aggregates- types & requirements. 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- Foundation for Machinery

Module II

Super structure: Brick masonry, English bond and Flemish bond, Stone masonry-Ashlar masonry- 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.

Leveling: Leveling instruments, different types, temporary adjustments, mean sea level, reduced level of point, booking of field notes, reduction of levels by height of collimation method.

References:

1. S.C. Rangawala, Engineering Materials, Charotar Publishing House, Anand.
2. Roy M. Thomas, Fundamentals of Civil Engineering, Educational Publishers,Ernakulam
3 Surendra Singh, Building Materials, Vikas Publishing Company, New delhi.
4 S.C. Rangawala, Building Construction, Charotar Publishing House, Anand.
5. P. Kanetkar, Surveying and Levelling, Volumes 1 and 2, United Book Corporation, Poona.

PART A - Type of Questions for University Exam. (Maximum Marks: 50) (To be answered in separate answer book)
Q 1 Four short answer questions of 5 marks each with two questions from each module. (4x5 = 20 marks)
Q 2. to Q.5 : Two questions A & B of 15 marks from each module with option to answer either A or B. (2 x 15 = 30 marks)

PART – B: BASIC MECHANICAL EGINEERING

Module I

Thermodynamics: Thermodynamics systems – open, closed and isolated systems, equilibrium state of a system, property and state, process, cycle, Zeroth law of thermodynamics- concept of temperature, temperature scales. First law – internal energy, enthalpy, work and heat, Different processes, isobaric, isochoric, isothermal and adiabatic processes Second law – Kelvin-plank and Claussius statements, Carnot Cycle.

Internal Combustion Engines: Air standard cycles – Otto and Diesel cycles, working of two stroke and four stroke Petrol and Diesel engines, Carburatted and MPFI engines, fuel pump, fuel injector, ignition system, cooling system, lubricating system.

Module II

Refrigeration and Air conditioning: Vapour compression and vapour absorption refrigeration systems, summer, winter and comfort air conditioning.

Manufacturing processes – Casting (sand and die casting processes), Forging (open &closed die forging), Rolling, Extrusion, Welding (resistance, arc and gas), brazing and soldering

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

Transmission of power: Belt drives (open and closed), Chain drives.

References:

1. P.K. Nag, Engineering Thermodynamics, Tata McGraw Hill
2. J.P. Holman, Thermodynamics, Mc Graw Hill
3. Rogowsky, Elements of Internal combustion Engines, Tata McGraw Hill
4. Gill, Smith & Ziurys, Fundamentals of Internal Combustion Engines, Oxford & IBH
5. Stoecker, Refrigeration and Air Conditioning, Tata McGraw Hill
6. Raghavan : Material Science and Engineering, Prentice Hall of India

PART B - Type of Questions for University Exam. (Maximum Marks: 50) (To be answered in separate answer book)
Q 1 Four short answer questions of 5 marks each with two questions from each module. (4x5 = 20 marks)
Q 2. to Q.5 : Two questions A & B of 15 marks from each module with option to answer either A or B. (2 x 15 = 30 marks)

1107 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

PART- A: ELECTRICAL ENGINEERING

Module I

Resistance : Circular wires – Wire Tables – Temperature Effects – Types of Resistors – Colour Coding and Standard Resistor Values – Conductance – Ohmmeters – Metric Units –The Memristor. **Ohm's Law, Power and Energy** : Ohm's Law – Plotting Ohm's Law – Power – Energy – Efficiency – Circuits Breakers, GFCI's and Fuses – Applications .

Series dc Circuits: Series Resistors – Series Circuits – Power Distribution and Series circuit – Voltage Sources in a Series – Kirchoff's Voltage Law – Voltage Division in a Series Circuit – Interchanging Series Elements – Notation – Voltage Regulation and the Internal Resistance of Voltage Sources. **Parallel dc Circuits:** Parallel Resistors – Parallel Circuits – Power Distribution in a Parallel Circuit – Kirchhoff's Current Law – Current Divider Rule – Voltage Sources in Parallel – Open and Short Circuits.

Capacitors: The Electric Field – Capacitance – Capacitors, **Inductors:** Magnetic Field – Inductance.

Module II

AC Fundamentals: Sinusoidal Alternating Waveforms - Sinusoidal ac Voltage Characteristics and Definitions – Frequency Spectrum – The Sinusoidal Waveform – General format for the sinusoidal Voltage of current – Phase Relations – Average Value – Effective (rms) Values – ac Meters and Instruments. Elementary Concepts of Energy Meter Watt Meter, Volt Meter and Ammeter.

The Basic Elements and Phasors: Response of Basic R,L and C Elements to a Sinusoidal Voltage or Current – Frequency Response of the Basic Elements – Average Power and Power Factor – Complex Numbers – Rectangular Form – Polar Form – Conversion between Forms.

Series and Parallel ac Circuits: Impedance and the Phasor Diagram- Series Configuration – Voltage Divider Rule – Frequency Response for Series ac Circuits –Admittance and Susceptance – Parallel ac Networks – Current Divider Rule – Frequency response of Parallel Elements.

Introduction to 3 phase Systems: StarΔ Connection

Elementary Concepts of Generation, Transmission, and Distribution: Various Levels of Power Transmission – Conventional Sources of Electrical Energy, Hydro, Thermal, Nuclear and Diesel Power Station - Introduction to Primary and Secondary distribution - Basic Concepts of Transformers - Principle of Operation – Applications to Power Systems.

PART- B: ELECTRONICS ENGINEERING

Module III

The Diode - Biasing the Diode, Voltage - Current Characteristic of a Diode, Diode Models, **Diode Applications -** Half Wave and Full Wave Rectifiers, Power supply Filters and Regulators, **Special Purpose Diodes -** Zener Diodes-Applications, Varactor Diodes, Optical Diodes-Other Types of Diodes. **Bipolar Junction Transistors (BJTs) -** Transistor Structure - Basic Transistor Operation, Transistor characteristics and parameters, Transistor as an Amplifier, Transistor as a Switch.

Module IV

Sensors-Temperature, light, force and sound sensors; **Actuators** – Heat, Light, force and sound actuators. **Electronic measurements** - measurements of voltages and currents, voltmeter, ammeter, multimeter, CRO (Block level treatment only)

Introduction to Electronic Communication systems: Modulation and Demodulation, Analog communication system, Electromagnetic frequency spectrum, Bandwidth and information capacity, Principles of Amplitude and angle modulation, Bandwidth requirements of angle modulated waves.

Optical communication: Fundamental concepts, Block diagram of an optical fibre communications system. **Cellular Telephone**: Fundamental concepts, Frequency reuse, Block diagram of a simplified cellular telephone system, Roaming and handoffs

Satellite communication: Block diagram of Satellite system link models – Uplink, Transponder Downlink.

References:

1. Boylestad, *Introductory Circuit analysis*, Pearson Education, 12/e, 2012.
2. Thomas L. Floyd, Electronic Devices, Pearson Education Inc. 7th edition.
3. Neil Storey, Electronics A systems approach, Pearson Education Inc. 2011 Wayne Tomasi, *Electronic Communication Systems: Fundamentals through Advanced,* Pearson Education Inc. 5th edition.

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

1108 COMPUTER PROGRAMMING

Module I

Basics of Computer and Information Technology:

Digital Computer System (CPU, Memory, I/O devices)- Working of a digital computer- Hardware and Software : Definition - Categories of Software, Application of Computers – Role of Information Technology – Internet Services

Problem Solving Methodology:

Program - Programming Process (Problem statement, Analysis, Design a solution, Implement/Coding the solution, Test the solution, Iteration through the phases to refine/correct the program)- Design tools (Algorithm, Flow-chart, Pseudo-code)- Develop algorithms for simple problems.

Module II

Programming Languages:

Types and generation of programming languages- Compiler – Interpreter-Linker –Loader –Execution of Program

Basics of C:

Character set-Identifier- Keywords- Constants –Data Types- Variables and declaration –Operators and Expressions – Operator precedence and associativity – Expression Evaluation (Simple Examples) - Input and output functions – Simple computational problems involving the above constructs.

Module III

Control Statements:

Selection, Conditional operator, Iteration (for, while, do-while), Branching (switch, break, continue, goto), Nesting of control statements- Problems using control statements.

Arrays and Strings:

1D and 2D arrays –Searching (Linear and Binary) - Sorting (Bubble, Selection) – Matrix manipulation programs – Strings and basic operations on strings – Strings functions - Programs on string manipulation

Functions:

Definition – Calling – Declaration – Parameter Passing (by value and by reference) – Recursion – Library functions – Programs based on functions

Module IV

User defined data types:

Structure – Union - Enumerated data type - Programs involving structure and union.

Pointers:

Declaration, Initialization – Pointers and arrays – Pointers and structures – Pointers and functions – Command line arguments – Dynamic memory allocation – Operations on pointers – Programs involving the above concepts

Files:

File concept – File pointer – File handling operations (open, close, read, write etc) on sequential and random access files. Programs on file manipulations using fgetc(), fgets), fseek.

References:

1. Pradip Dey and Manas Ghosh, Computer Fundamentals and Programming in C, Oxford.
2. Samarjit Ghosh, All of C, PHI Learning
3. Byron Gottfried , Programming with C , 2nd edition, TMH publication.
4. B.W. Kernighan and D.M. Ritchie, The C Programming Language, Pearson Education.
5. R G Dromey , How to solve it by Computer, Prentice Hall
6. D.E. Knuth, The Art of Computer Programming – Volume 1,2 &3, Addison Wesley.
7. Yashwant P. Kanetkar, Let Us Use C, 8th Edition (Paperback).
8. Sukhendu Dey , Complete Knowledge in C, Narosa
9. Varghese Paul, Computer Fundamentals, EPD.

Type of Questions for University Exam

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each module with option to answer either A or B. (4x15 = 60 marks)

1109 ENVIRONMENTAL STUDIES AND TECHNICAL COMMUNICATION

PART – A: ENVIRONMENTAL STUDIES (1 hour / week)

Module I

Natural resources - issues related to the use and over exploitation of forest resources, water resources, mineral resources, food resources, energy resources and land 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. Threats to biodiversity, Conservation of biodiversity.

Module II

Environmental Pollution - 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. Disaster Management: Floods, earth quake, cyclone and landslides. Role of public awareness in disaster management.

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, case studies - Population growth and problems of population explosion – Environment and human health – Human rights – Value education – Role of Information Technology in environment and human health - Environmental ethics: issues and possible solutions.

References:

1. Rajagopalan. R, Environmental Studies: From Crisis to Cure, Oxford University Press, 2005
2. Erach Bharucha, Textbook of Environmental Studies and Ethics, Universities Press (India), Hyderabad, 2005.
3. Jayashree A. Parikh, V.M. Balsaraf, P.B. Dwivedi, Environmental Studies, Ane Books Pvt. Ltd., 2010.
4. Anindita Basak, Environmental Studies, Pearson, 2009.
5. Gouri Suresh, Environmental Studies and Ethics, I.K. International Publishing House Pvt. Ltd., New Delhi, 2007.
6. S.P. Misra, Essential Environmental Studies, 3rd Edition, Ane Books Pvt. Ltd., 2011.
7. Benny Joseph, Environmental Science & Engineering, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
8. Meenambal T , Uma R M and K Murali, Principles of Environmental Science and Engineering, S. Chand & Company Ltd, 2005

PART – B: TECHNICAL COMMUNICATION (1 hour / week)

This is a practice oriented, need based, and functional – communicative course. It is intended to develop the student's skill of communication in listening, speaking, reading and writing. The student is advised to cultivate the habit of reading newspapers, magazines and books in a free, extensive manner to consolidate the skill already achieved. A more inter-active process of teaching/learning is called for in order to achieve effective communication.

Questions at the class tests and semester end examination will be largely problem solving and application oriented in nature.

Module I

Communicative Grammar: Time, tense and aspect; Verbs of state and event; Use of preposition; Expressing emotions and attitudes: Hope, anticipation of pleasure, disappointment, approval, disapproval, surprise.

The sounds of English: (it is not a course in phonetics. Technical terms will not be used except when absolutely necessary.)

Length of vowels-long and short vowels

/ | /, / 3 : /, /a :/, / : /, /U : / | / / 2 /, /,/ ʌ /, / O /, / U / - Consonants : / f, v, o, o, s, z, 3/ - Stress pattern - Intonation: failing and rising.

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; interviews; group 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

Written Communication: note making and note taking; summarizing; notes and memos; developing notes into text; organization of ideas: cohesion and coherence; Preparing notes – writing business letters and E-mail messages. Organizing a meeting, preparing an agenda, chairing a meeting, drafting motions and resolutions, writing minutes.

Paragraph writing: Paragraph writing – Topic sentence, cohesion and coherence- sentence liners (so, but, however etc), 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. Preparation of a business report-writing a business proposal - format, length,structure.

Spelling rules and tips; writing a rough draft; editing and proof reading; writing the final draft; styling text; filling in complex forms; standard letters; Writing a curriculum vitae (both chronological & functional) along with an application for a job; Public relation – Concept and relevance – PR in a business organization-handing the media; 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.

References :

1.John Seely, Oxford Guide to Writing and Speaking, Oxford University Press.
2.C. Muralikrishna and Sunita Mishra, Communication Skills for Engineers, 2nd Edition, Pearson, 2011.
3.Meenakshi Raman and Sangeetha Sharma, Technical Communication: Principles and Practice, Oxford University Press, 2004.
4.Krishna Mohan and Meenakshi Raman, Effective English Communication,Tata Mc-GraHill,2000.
5.William Sanborn Pfeiffer, T.V.S. Padmaja, Technical Communication – A Practical Approach, Pearson, 2007.
6.R.C. Bhatia, Business Communication, 2nd Edition, Ane Books Pvt. Ltd., 2008.
7.Krishna Mohan and Meera Banerji, Developing Communication Skills, Mac Millan India Ltd, 2000.

University Examination Pattern

The question paper will have two parts. Part A and Part B will have a weightage of 50 marks each and they will have to be answered in separate answer books.

Question Paper Pattern for Part A (Environmental Studies)

Q I. – 6 short type questions of 3 marks each, with three questions from each module (6 x3 = 18)
QII. – 2 questions A and B of 16 marks from Module I with choice to answer one. Both A and B should have a minimum of two sub – sections.
QIII - 2 questions A and B of 16 marks from Module II with choice to answer one. Both A and B should have a minimum of two sub – sections.

Question Paper Pattern for Part B (Technical Communication)

Q I – 10 short answer questions of 2 marks each, with five questions from each module. The questions shall be problem solving and application oriented in nature. (10x2 = 20 marks)
QII. – 2 questions A and B of 15 marks from Module I with choice to answer one. Both A and B should have a minimum of two sub – sections. The questions shall be problem solving and application oriented in nature.
QIII - 2 questions A and B of 15 marks from Module II with choice to answer one. Both A and B should have a minimum of two sub – sections. The questions shall be problem solving and application oriented in nature.

11 L1 ELECTRICAL AND MECHANICAL WORKSHOPS

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

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

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

Note : 50 % marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50 % marks in the aggregate and 50 % minimum in the end semester examination for a pass.

11 L2 COMPUTER PROGRAMMING LABORATORY

Application packages

Word
1. To create an advertisement in Word.
2. To illustrate the concept of mail merging in word.

Spread Sheet
3. To create a spread sheet to analyse the marks of the students of a class and also to create appropriate charts.

Power Point
4. To create the presentation for the department using Power Point.

C Programming Basics

Operators & Expressions
5. To write a simple menu driven calculator program using switch statement

IO Formatting
6. To write a program to print Pascal's triangle.

Decision Making
7. To write a program for electricity bill preparation.

Looping
8. To write a program to print the *sine* and *cosine* series.

Arrays
9. To write a program to perform Matrix multiplication.
10. To write a program to prepare and print the sales report.

String
11. To write a program to perform string manipulation manipulations function like *string concatenations, comparison, find the length and string copy* without using library functions.
12. To write a program to arrange names in alphabetical order.

Functions
13. To write a C program to calculate the mean, variance and standard deviation using functions.
14. To write a C program to perform sequential and binary search using functions.

Recursion
15. To write a program to print the Fibonacci series and to calculate the factorial of the given number using functions.

Structures
16. To print the mark sheet of n students using structures.

Pointers
17. To write a program using pointers to access the elements of an array and count the number of occurrences of the given number in the array.

Note : 50 % marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50 % marks in the aggregate and 50 % minimum in the end semester examination for a pass.

11 L3 LANGUAGE LABORATORY

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

Objectives:

1. To expose the students to a variety of self-instructional, learner-friendly modes of language learning.
2. To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer-based competitive exams.
3. To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
4. To train them to use language effectively to face interviews, group discussions, public speaking.
5. To initiate them into greater use of the computer in resume preparation, report writing, format-making etc.

SYLLABUS :

The following course content is prescribed for the **English Language Laboratory** sessions:

1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
2. Introduction to Stress and Intonation.
3. Situational Dialogues / Role Play.
4. Oral Presentations- Prepared and Extempore.
5. 'Just A Minute' Sessions (JAM).
6. Describing Objects / Situations / People.
7. Information Transfer
8. Debate
9. Telephoning Skills.
10. Giving Directions.

Note : 50 % marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50 % marks in the aggregate and 50 % minimum in the end semester examination for a pass.

CE/CS/EB/EC/EE/EI/FT/IT/ME/SE 1301 ENGINEERING MATHEMATICS 1I

Module I

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: Fourier 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

Laplace 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.

References:

1) Advanced engineering mathematics: Erwin Kreyszig ,John Wiley
2) Advanced engineering mathematics: R.K.Jain, S.R.K.Iyengar, Narosa Publishers.
3) Advanced engineering mathematics: C.R.Wilie & L.C.Barrett, Mc Graw Hill
4) Mathematical techniques for engineers & scientists Larry C Andrews, Ronald C Philips, Phi Publishers
5) Advanced engineering mathematics M.C.Potter, J.L.Goldberg Oxford University Press
6) Higher engineering mathematics: B.S.Grewal, Khanna Publishers

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

CS/EB/EC/EI/IT/ME 1302: 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 Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)
Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1303: 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, relation ship 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-propped cantilevers and fixed beams

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

References:

1) Gere & Timoshenko: Mechanics of Materials, CBS Publishers
2) E.P.Popov : Introduction to mechanics of solids, Pearson Education
3) Beer & Johnston: Mechanics of Solids, Mc Graw Hill
4) Shames & Pittaresi: Introduction to Solid Mechanics ,PHI
5) Mott : Applied strength of materials, PHI
6) Carl. T.F Roses, Strength of Materials & Structures, Elsevier

Type of Questions for University Exam

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1304: FLUID MECHANICS

Module 1

Preliminaries, Concept of continuum, Properties of fluids – density – pressure – viscosity - surface tension - capillarity - vapour pressure, Fluid statics, Basic equations of fluid statics, Variation of pressure in a fluid, - Manometry - Forces on surfaces and bodies in fluids, Floatation - stability of bodies in fluid - metacentric height and its measurement, Fluids in rigid body motion, Fluid kinematics -Eulerian and Lagrangian description - local and material rates - deformation of a fluid element -strain rate-velocity relations, Graphical description of flow – streamlines - path lines - streak lines - stream tube, Fluid dynamics - concept of the control volume -Reynolds transport equation and its use to formulate fluid mechanics problems, Integral and differential forms of the continuity - momentum and energy equations, Illustrative examples.

Module II

One dimensional flow through pipes, Non viscous equation for the flow through a stream tube and along a stream line – Euler's equation – Bernoulli's equation, - Energy equation, Applications of the one dimensional equations - velocity and flow measuring devices and quasi steady problems, Laminar and turbulent flow through pipes - Hagen- Poiseuille equation - Darcy-Weisbach equation - pipe friction -Moody's chart - minor losses in pipes

Module III

Two dimensional incompressible inviscid flows – Vorticity - Vortex tube - Irrotational flow - Velocity potential, Stream function - relation between stream function and potential function in ideal flows -Equation of a streamline - governing equations, Fundamental flow patterns, Combination of basic patterns - Rankine half body - Rankine oval - Doublet and flow over a cylinder, Magnus effect and the calculation of lift on bodies.

Module IV

Plane viscous flow past bodies, The boundary layer - Prandtl's boundary layer equations, Blasius solution for the boundary layer over a flat plate, Karman's Momentum Integral equations - Solutions using simple profiles for the boundary layer on flat plate - calculation of skin friction drag.

References:

1) Shames, I.H., 'Mechanics of fluids', Mc Graw Hill Book Co.,
2) White, F.M., 'Fluid Mechanics', 6th Ed., Tata Mc Graw Hill, New Delhi
3) Cengel, Y.A, Cimbala, John, M., 'Fluid Mechanics, Fundamentals and Applications', 7th Ed. Tata Mc GrawHill, New Delhi,
4) Gupta, V., Gupta, S.K.., 'Fluid Mechanics and its applications', New Age International, New Delhi,
5) Som, S.K., and Biswas, G., 'Fluid Mechanics and fluid Machines', 2nd Ed., Tata Mc Graw Hill, New Delhi.
6) Cohen and Kundu - Fluid Mechanics, Elsevier
7) V. Babu, Fundamentals of Incompressible flows, Ane Publishers.
8) Massey, Fluid Mechanics,ELBS

Type of Questions for University Exam

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)
Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1305: 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,

Module IV

Applications of ferrous and non ferrous alloys-steel- low, medium, high carbon steels-Stainless steels ferritic, austenitic, martensitic, duplex steels-tool steels cast iron- gray, white, ductile cast irons- copper and its alloys-aluminium and its alloys-magnesium and alloys- titanium and its alloys-refractories- super alloys-ceramics--composite and glasses-shape memory alloys- Nano materials, bio materials-Optical fibers

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) Avner: Mechanical metallurgy, McGraw Hill
6) Narula : Material Science, Tata McGraw Hill
7) B.K.Agarwal : Introduction to engineering materials, Tata McGraw Hill
8) Manas Chanda : Science to Engg. Materials Vol I, II and III, Macmillan Co. of India.
9) T.V Ravi,C.P Sharma, Heat Treatment Principles & Techniques, PHI
10) Fischer, Materials Science for Engineering Students –Elsevier

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1306 : MACHINE DRAWING

Module I

Introduction to Machine Drawing: Conversion of pictorial views to orthographic views

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.

References:

1) N.D. Bhatt : Elementary engineering drawing (Charotar publishing house, Anand)
2) Parkinson : First year engineering drawing (Pitman, London)
3) P.S. Gill : Machine drawing (Kataria & Sons, Ludhiana)
4) K.C. John : Text Book of Machine Drawing, PHI
5) K.R.Hert : Engineering drawing with problems and solutions (ELBS)
6) Basudeb Bhattacharyya: Machine drawing,Oxford

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 13 L1 : 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 conducted by two examiners. A candidate shall secure a minimum of 50 % marks in the aggregate and 50 % minimum in the end semester examination for a pass.

ME 13 L2: FLUID MECHANICS LAB

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 conducted by two examiners. A candidate shall secure a minimum of 50 % marks in the aggregate and 50 % minimum in the end semester examination for a pass.

CE/CS/EB/EC/EE/EI/FT/IT/ME/SE 1401 : 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.

References:

1) Advanced Engineering Mathematics: R.K.Jain, S.R.K.Iyengar, Narosa Publishers.
2) Advanced Engineering Mathematics: C.R.Wilie & L.C.Barrett, Mgh
3) Advanced Engineering Mathemartics Erwin Kreyszig, Wilsey Eastern
4) Complex Variables & Applications Churchill R.V.. Mgh Publishers.
5) Advanced engineering mathemartics M.C.Potter, J.L.Goldberg Oxford Unversity Press
6) Higher engineering mathematics: B.S.Grewal, Khanna Publihsers

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1402 :METROLOGY & INSTRUMENTATION

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; **Limits, Fits & Tolerance**: systems of limits and fits, Hole basis and shaft basis system of representation ; tolerances for linear dimensions, calculation of tolerance grade, representaion.
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
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 IV
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

References:

1) Measurement systems – Application & Design: Doebelin E.O., Tata McGraw Hill
2) Metrology - Hume, McDonald
3) Metrology, Sharpe, ELBS
4) Metrology ,Taher, ELBS
5) Mechanical Measurements: Beckwith, Marangoni, Lienhard, Pearson Education

Type of Questions for University Exam.
Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)
Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1403 : MECHATRONICS

Module I

Introduction to Mechatronics – scope -Mechatronics and Engineering Design. Sensors and transducers – classification-thermal, electrical, optical, acoustic, pneumatic, magnetic, and piezo electric sensors. Open loop and closed loop control systems -continuous and discrete processes -servo mechanism – principles -components -error detectors -potentiometers-types. Pneumatic and hydraulic systems -mechanical and electrical systems.

Module II

System modelling -mathematical models -mechanical, electrical, fluid and thermal system building blocks -system models -dynamic response of systems -first and second order systems -modelling dynamic systems - system transfer functions - frequency response

Closed loop controllers -proportional, derivative and integral controls -PID controller -digital controllers - controller tuning - adaptive control of machine tools.

Module III

Stability analysis: 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.

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

Module IV

Stages in designing mechatronic systems - traditional and mechatronic design -possible design solutions, robot position and proximity sensing -tactile sensing. Man-machine interface. Micro controllers and microprocessors - digital logic circuits -micro controller architecture and programming -programmable logic controllers. Automatic control and real time systems-

case studies of mechatronic systems -pick and place robot -automatic car park system -engine management system.

References:

1) Mechatronic Systems Fundamentals - Rolf IseRmann , Springar Internation Edition
2) Mechatronics – W. Bolton , Pearson Education
3) Mechatronics – Singh & Joshi ,PHI
4) Introduction to Mechatronics and Measurement System - David G Alciatore, Michael B Histand, Tata McGraw Hill
5) Mechatronics : Principles and Applications by Onwubolu- Elsevier
6) Modern Control Systems: Dorf & Bishop, Pearson Education
7) Modern Control Engineering: Ogata K, Pearson Education
8) Modern Control Systems: B.C Kuo

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1404 :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

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

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.

References:

1) Engineering Thermodynamics D.B. Spalding & E.H.Cole
2) Engineering Thermodynamics Van Wylon
3) Thermodynamics J.P.Holman
4) Engineering Thermodynamics P.K.Nag
5) Engineering Thermodynamics Bacon, Butterworth

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1405 : 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

References:

6) D.G.Shepherd : Principles of turbo machinery-Mac Millan Publishing Co. Inc.
7) Agarwal : Fluid mechanics & Machinery, TMH.
8) Douglas, Gasiorek, and Swaffield : Fluid mechanics – Pitman
9) Daugherty & Franzini : Fluid mechanics with Engg. Applications McGraw Hill
10) Vallentine : Applied hydrodynamics – Butterworths – London.
11) Herbert Addison : A treatise on applied hydraulics.
12) A.J. Stepanof : Centrifugal and axial flow pumps, Wiley, New York.
13) Som & Biswas : Introduction to fluid mechanics & Machinery (TMH)
14) Shaughnessy, Introduction to Fluid Mechanics, OXFORD

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1406 : 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

References:

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
11) Manufacturing Process Science M I Khan & Srejul Haque,PHI
12) Manufacturing Process: Kaushik, PHI
13) Manufacturing Technology –Vol 1:P.N Rao,Tata McGraw Hill

* can be used as text book

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)
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ME 14 L1 : ELECTRICAL MACHINES 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 conducted by two examiners. A candidate shall secure a minimum of 50 % marks in the aggregate and 50 % minimum in the end semester examination for a pass

ME 14 L2 : HYDRAULIC MACHINERY LAB

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 conducted by two examiners. A candidate shall secure a minimum of 50 % marks in the aggregate and 50 % minimum in the end semester examination for a pass.

CE/CS/EB/EC/EE/EI/FT/IT/ME/SE 1501: 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.

References:

1) Probability And Statistics For Engineers: Irvrin Miller & Freiend, Prentice Hall Of India
2) Numerical Methods: S.S.Sastry, Phi Publishers.
3) Numerical Methods: P.Kandaswamy.K.Thilagavathy, K.Gunavathy, S.Chand & Co.
4) Probability, Random Variables and Stochastic Processes A.Papoulis, Mgh Publishers

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1502 : 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 II

Spur gear: gear terminology, conjugate gears, involute arc of motion, generation of gear teeth profiles, interference, cycloidal and involute gear characteristics, law of gearing, length of path of contact, length of arc of contact, contact ratio, 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 III

Cams: Classification of cams and followers, geometry of radial cams, displacement diagrams, follower motion, uniform velocity, simple harmonic, uniform acceleration and retardation, cycloidal, parabolic, graphical layout of cam profiles, displacement, velocity, acceleration and jerk relations, pressure angle, analysis of tangent cam, convex sided cams with roller follower and flat faced followers.

Friction: Laws of friction, Limiting angle of friction, Flat pivot bearing, Flat collar bearing, Conical pivot bearing, Efficiency of inclined plane, Screw friction, Screw Jack, Torque required to lift and lower the load by screw jack, Efficiency of a screw jack.

Module IV

Friction clutches – Single disc clutch, Multiple disc clutch, Cone clutch, Centrifugal clutch.

Dynamometer – Types of dynamometer, Prony brake dynamometer, Rope brake dynamometer, Belt transmission dynamometer, Torsion dynamometer

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.

References:

1) Theory of Machines: Rattan, Tata McGraw Hill
2) Theory of Machines and Mechanisms: Ghosh & Mallick, Prentice Hall India
3) Machines & Mechanisms : Myszka, Pearson Education
4) Theory of Machines : Thomas Bevan, Pearson Education
5) Theory of Mechanism & Machines, Sharma & Purohit, PHI
6) Theory of Machines and Mechanics: Uicker, Pennock, and Shigley, Mc Graw Hill
7) Mechanism & Machine Theory:Ashok G.Ambekar,PHI
8) Kinematics & Dynamics of Machinery, Norton, McGraw Hill
9) Kinematics, Dynamics and Design of Machinery, Waldron & Kinzel, Wiley

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1503 : MACHINE TOOLS & MACHINING SCIENCE

Module 1

Engine lathe,Principle of working, specification of lathe, types of lathes, work holders, tool holders, Box tools, Taper turning, thread turning, for Lathes and attachments.
Turret and capstan lathes, collet chucks, other work holders,tool holding devices.
Principal features of automatic lathes – classification – Single spindle and multi-spindle automatic lathes. Shaping slotting and planing machines, Principles of working, Principal parts, Specification classification, Operations performed. Kinematic scheme of the shaping slotting and planning machines, machining time calculations. Drilling and Boring Machines, Principles of working, Specifications, types, Operations performed, Tool holding devices, Twist drill, Boring machines, Fine boring and Jig boring machines.

Module II

Milling Machine, Principles of working, Specifications, Classifications of milling machines, Principal features of horizontal, vertical and universal milling machines, Machining operations, Types of milling cutters, Methods of indexing, Accessories to milling machines, Grinding machine, Fundamentals, Theory of grinding , Classification of grinding machine, Ccylindrical and surface grinding machine, Tool and cutter grinding machine, Special types of grinding machines, Different types of abrasives – bonds specification of a grinding wheel and selection of a grinding wheel, Lapping, honing and broaching machines , Comparison to grinding .
Jigs &Fixtures: Types and their application for turning, milling, drilling and boring, Principles of location and clamping, tool guidance.

Module III

Introduction to Machining: Basic Mechanism involved, Plastic deformation, Mechanism of Plastic Deformation, Chip formation, Typical lathe tools; Orthogonal cutting; oblique cutting; Types of chips, Mechanism of built-up-edge formation, Tool geometry, Reference planes; Tools specification, Selection of tools angles; Multi-point cutting tools-geometry of peripheral milling cutters and twist drills, Thermal aspects of machining, Regions of heat generation, Distribution of heat generated, Equations of flow due to conduction, transportation, heat absorbed and heat generated; Average shear plane temperature; Average chip-tool interface temperature;

Module IV

Mechanics of metal cutting, Merchant's circle diagram, Determination of cutting and thrust forces, Coefficient of friction, Measurement of shear angle, Direct and indirect methods; Mohr's circle diagram, Lee and Shaffer's relationship, Friction in Metal cutting, Mechanics of oblique cutting, Concept of rake angle measured in different planes, Shear angle; Velocity and force relationship. Tool wear and tool life, Mechanism of wear, Progressive tool wear, Flank wear, Crater wear, Model of diffusion wear; Tool life : Variables affecting tool life-Cutting conditions, Tool geometry; Tool materials; work materials; Work materials; Cutting fluids; Determination of tool life equation; Machinability, Economics of machining

References:

1) Production Technology by R.K. Jain and S.C. Gupta.
2) Production Technology by H.M.T. Tata McGraw Hill
3) Modern Machining Processes – P.C.Pandey, H.S.Shan, Tata McGraw Hill.
4) Machining Science by Ghosh & Mallick, Affiliated East West Press
5) Machine tool practices – Richard R Kibbe,Roland O Meyer
6) Manufacturing Technology Volume -2 : P.N Rao ,McGraw Hill
7) ASTME: Fundamentals of Tool Design
8) Donaldson : Tool Design, Mc Graw Hill

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Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)
Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1504 : THERMAL ENGINEERING

Module I

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.

Module II

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 III

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.

Module IV

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.

References:

1) Cengel and Boles, Thermodynamics- An Engineering Approach, Tata McGraw Hill
2) M.I. Mallev, Internal Combustion Engines
3) Engineering Thermodynamics Bacon, Butterworth
4) Elements of Internal Combustion Engine Rogowsky, Tata McGraw Hill
5) Fundamentals of Internal Combustion EnginesGill, Smith & Ziurys, Oxford
6) Modern Petrol Engine Judge, Chapman & Hall
7) Applied Thermodynamics for Engineering Technology sts- T.D Eastop , A Mc Conkey
   Pearson Education

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)
Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1505 : 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 Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1506 : 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. Hydroelectric power plants – general layout – types of dams – penstock, draft tubes, surge tanks - power house equipments – site selection

Module II

Diesel engine power plant – Layout – Components of a diesel power plant – starting methods – Gas turbine – open and closed cycles – thermodynamics cycles – regeneration – reheating – intercooling – efficiency and performance of gas turbines. combustion chambers of gas turbines – cylindrical – annular and industrial type combustion chamber design– combustion efficiency –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.

Reference

1) E.I. Wakil, Power Plant Engineering, McGraw Hill
2) P.K. Nag, Power Plant Engineering, Tata McGraw Hill
3) Morse, Power Plant Engineering, Van Nostrand Co.
4) Lee J.F., Power Station Engineering and Economy, Tata McGraw Hill
5) Robert Loftness, Nuclear Power Plants, McGraw Hill
6) Verma Mahesh, Power Plant Engineering
7) Rai G D, Non Conventional Energy Sources
8) Power plant Engg Gas turbine theory : Cohen Cohen & Rogers

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 15 L1: COMPUTATIONAL METHODS 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.

References:

1) Chapra and Canale, *Numerical methods for scientist and engineers,* McGraw Hill.
2) Froberg, *Introduction to numerical analysis*, Addison Wesley.
3) Kandaswamy, *Numerical Analysis*, S Chand
4) Hildebrand, *Introduction to Numerical Analysis,* Tata McGraw Hill.

Note : 50 % marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50 % marks in the aggregate and 50 % minimum in the end semester examination for a pass

ME 15 L2: MACHINE SHOP

Introduction to Machine Tools : Types of Machine tools, Spindle drive – work holding devices 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 on Lathe: cylindrical turning, Taper Turning, Facing, Shoulder turning and curve turning – thread cutting, internal thread
Exercises on Milling Machine: Face milling, End Milling, Gear cutting
Exercises on Drilling and Boring Machines
Exercises on Shaping and Slotting Machines
Exercises on Grinding Machines

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 conducted by two examiners. A candidate shall secure a minimum of 50 % marks in the aggregate and 50 % minimum in the end semester examination for a pass.

ME 1601: 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.

Brakes – Types of brakes, Block brake, Band brake, Band and Block brake, Internal expanding brake, Condition of self locking, Power transmitted and Heat generated.

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, Rope and Chain drives: Types of belt drives, Velocity ratio, Slip, Creep, Length of belt, Power transmitted, Ratio of tensions, Angle of contact, Centrifugal tension, Maximum tension, Initial tension, V belt drive, Ratio of Tensions in V belt and Rope drives, Kinematics of chain drive, Classifications of chains, Chain length.

Governors – Watt governor, Porter governor, Proell governor, Hartnell governor, Sensitiveness, Hunting, Isochronism, Effort of governor, Controlling force.

References:

1) Theory of Machines: Rattan, Tata McGraw Hill
2) Theory of Machines and Mechanisms: Ghosh & Mallick, Prentice Hall India
3) Machines & Mechanisms : Myszka, Pearson Education
4) Theory of Machines : Thomas Bevan, Pearson Education
5) Theory of Mechanism & Machines, Sharma & Purohit, PHI
6) Theory of Machines and Mechanics: Uicker, Pennock, and Shigley, Mc Graw Hill
7) Mechanism & Machine Theory:Ashok G.Ambekar,PHI
8) Kinematics & Dynamics of Machinery, Norton, McGraw Hill
9) Kinematics, Dynamics and Design of Machinery, Waldron & Kinzel, Wiley

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks).

ME 1602: 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

References:

1) Mechanical engineering design, Joseph Edward Shigley, TMH
2) Design of machine elements, Bhandari, TMH
3) Design of machine elements, M.F Spotts, Prentice hall India
4) Machine Design, Sadhu Singh
5) Machine Design, Pandya & Shah
6) Machine Design, R.K Jain
7) Machine component design :Robert C. Juvinall, Kurt M. Marshek Wiley India
8) Design of machine elements - U.C Jusdal Pearson
9) Design of machine elements, Sharma & Purehit, PHI
10) Design of machine elements Vol I and II ,T Krishna Rao, IK International Publishing House, New Delhi

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)
Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1603 : 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
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
Aggregate 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

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.

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 Exam.
Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)
Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1604 : HEAT AND MASS TRANSFER

Module I

Introduction to heat transfer – basic modes of heat transfer – conduction heat transfer –Fourier law of heat conduction– temperature dependence of thermal conductivity- general heat conduction equation in cartesian, cylindrical and spherical coordinates – boundary conditions – one-dimensional steady state conduction- critical insulation thickness -one-dimensional steady state conduction with heat generation -extended surface – two dimensional steady state heat conduction – conduction shape factor – unsteady state heat conduction in one dimension – lumped heat capacity system – semi-infinite solids with sudden change in surface temperature – Introduction to numerical methods in conduction.

Module II

Convective heat transfer – Newton's law of cooling – Prandtl number – laminar forced convection heat transfer from flat plates – fully developed laminar flow in pipes – turbulent forced convection – Reynolds' analogy – natural convection – natural convection heat transfer from vertical plates and horizontal tubes – 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-Ficks law of diffusion.

Module III

Radiative transfer – electromagnetic radiation spectrum – thermal radiation –radiation properties- black body, gray body – monochromatic and total emissive power – Planck's law – Stefan-Boltzman law – Wien's displacement law – Kirchhoffs identity – shape factor- reciprocity relation – heat exchange between non black bodies; surface and shape resistances- electrical network analogy- heat transfer between parallel surafces – radiation shields.

Module IV

Heat Exchangers: Type of heat exchangers- overall heat transfer coefficient -fouling factors -Logarithmic mean temperature difference (LMTD)- derivation of LMTD for parallel flow and counter flow heat exchangers-LMTD correction factor- effectiveness, NTU method of heat exchanger analysis- effectiveness derivation for parallel flow and counter flow heat exchangers. Design of parallel flow-counterflow-shell and tube multipass heat exchangers-condensers.

References:

1) Cengel, Heat Transfer Tata McGraw Hill
2) Holman J.P., "Heat Transfer", McGraw Hill International Students Edition
3) Incorpera F.P. & De Witt D.P., "Fundamentals of Heat and Mass Transfer", John Wiley
4) Kreith F., "Heat Transfer", International Text Book Company
5) Gebhart B., "Heat Transfer", McGraw Hill
6) R.K. Rajput, "Heat and Mass Transfer", S Chand.
7) Venkanna, Fundamentals of HMT, PHI

Data Book (1) Heat & Mass Transfer – C.P Kothandaraman, New Age International.
Data Book (2) Heat & Mass Transfer – Domkundwar, Dhanpat Rai.

Approved data book to be specified in the question paper.

Type of Questions for University Exam

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1605 : 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 II

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

References:

1) Grover & Zimmers “CAD/CAM” PHI
2) Radhakrishnan “CAD/CAM”,TMH
3) Michael P.G Grover, “Automation, Production Systems and Computer Aided Manufacturing”, Prentice Hall, 1980
4) Mechatronics : HMT (TMH)
5) CNC Machine Tools and Computer aided Kundra T.K, Rao P.N. and Tiwari N.K.
6) Manufacturing Engineering Hand Books 1984 SME
7) CAD/CAM theory & Practice : Zeid (TMH)
8) CNC Programming made easy: B.K.Jha , Vikas Publishing House
9) Robot Technology – Fundamental: James G Keramas , Vikas Thomson Learning

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1606 E1 : HYDRAULIC AND PNEUMATIC DRIVES

Module I

Introduction to oil hydraulics and pneumatics, their advantages and limitations, ISO symbols and standards in Oil Hydraulics and pneumatics, Recent developments, applications, Basic types and constructions of Hydraulic pumps and motors, Ideal pump and motor analysis, Practical pump and motor analysis, Performance curves and parameters.

Module II

Hydraulic Actuators, Hydraulic control elements – direction, pressure and flow control valves. Valve configurations, General valve analysis, valve lap, flow forces and lateral forces on spool valves, Series and parallel pressure compensation flow control valves, Flapper valve Analysis and Design, Analysis of valve controlled and pump controlled motor, Electro-hydraulic servo valves-specifications, selection and use of servo valves.

Module III

Electro hydraulic servomechanisms – Electro hydraulic position control servos and velocity control servos, Nonlinearities in control systems (backlash, hysteresis, dead band and friction nonlinearities). Basic configurations of hydraulic power supplies – Bypass Regulated and Stroke Regulated Hydraulic Power Supplies, Heat generation and dissipation in hydraulic systems: Design and analysis of typical hydraulic circuits, Use of Displacement – Time and Travels-Step diagrams: Synchronization circuits and accumulator sizing. Meter - in, Meter - out and Bleed-off circuits: Fail Safe and Counter balancing circuits.

Module IV

Components of pneumatic systems: Direction, flow and pressure control valves in pneumatic systems, Development of single and multiple actuator circuits, Valves for logic functions: Time delay valve, Exhaust and supply air throttling, Examples of typical circuits using Displacement – Time and Travel-Step diagrams, Will-dependent control, Travel-dependent control and Time dependent control, combined control, Program Control, Electro-pneumatic control and air hydraulic control, Applications in Assembly, Feeding, Metalworking, materials handling and plastics working.

References:

1) Joji,P., Pneumatic controls, Wiley India Pvt. Ltd., 2008.
2) Anthony Esposito., Fluid Power with applications, Pearson Education.
3) Ernst, W., Oil Hydraulic Power and its Industrial Applications, New York, McGraw Hill.
4) Lewis, E. E., and H. Stern, Design of Hydraulic Control Systems, New York, McGraw Hill.
5) Morse, A. C., Electro hydraulic Servomechanism, New York, McGraw Hill.
6) Pippenger, J.J., and R.M. Koff, Fluid Power Control systems, New York, McGraw Hill.
7) Fitch, Jr., E.C., Fluid Power Control Systems, New York, McGraw Hill.
8) Khaimovitch., Hydraulic and Pneumatic Control of Machine Tools.
9) John Watton., Fluid Power Systems: modeling, simulation and microcomputer control, Prentice Hall Int.
10) Herbert E. Merritt., Hydraulic control systems, John Wilely and Sons Inc.
11) Thoma, Jean U., Hydrostatic Power Transmission, Trade and Technical Press, Surrey, England.

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1606 E2: 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.

References :

1) Theory of Elasticity : Timoshenko & Goedier, McGraw Hill
2) Advanced Mechanics of Materials: Solecki & Conant: Oxford University Press
3) Advanced Mechanics of Solids : L.S. Srinath, Tata McGraw Hill
4) Solid Mechanics: SMA Kazimi, Tata McGraw Hill
5) Advanced mechanics of materials : Boresi& Schmidt, Wiley
6) Theory of Isotropic /Orthotropic elasticity – An introductory primer – K. Bhaskar & T.K Varadan, Ane Books

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1606 E3 : ENERGY CONSERVATION & ENVIRONMENT PROTECTION

Module I

Overview of World Energy Scenario. Fossil Fuel Reserves - Estimates, Country Energy Balance Construction - Examples Trends in energy use patterns, Energy Economics - Simple Payback Period, IRR, NPV, Life Cycle Costing.

Module II

Importance of energy management. Energy auditing: methodology, analysis of past trends plant data), Steam Systems: Boiler -efficiency testing, excess air control, Steam distribution & use - steam traps , condensate recovery , flash steam utilisation. Thermal Insulation. Energy conservation in Pumps, Fans (flow control), Compressed Air Systems, Refrigeration & air conditioning systems. Waste heat recovery.

Module III

Cogeneration - concept, options (steam/gas turbines/diesel engine based), selection criteria. Heat exchanger networking- concept of pinch, target setting, composite curves. Renewable energy sources- overview of solar, wind, tidal, geothermal , nuclear energy sources.

Module IV

Environmental Impacts of energy use - Air Pollution - SOx, NOx, CO, particulates Solid and Water Pollution, Formation of pollutants, sources of emissions. Exhaust emission test, procedures, standards and legislation; environmental audits; Emission factors and Global Warming, CO2 Emissions, Impacts. Water pollution

References:

1) Energy and the Challenge of Sustainability, World energy assessment, UNDP, New York, 2000.
2) Global energy perspectives / edited by Nebojsa Nakicenovic, Arnulf Grubler and Alan McDonald, Cambridge University Press, 1998
3) J.M. Fowler, Energy and the environment,. 2nd Ed. ,McGraw Hill, New York, 1984
4) L. C. Witte, P. S. Schmidt and D. R. Brown , Industrial Energy Management and Utilisation, Hemisphere Publ, Washington,1988.
5) Industrial Energy Conservation Manuals, MIT Press, Mass, 1982.
6) W.F. Stoecker , Design of Thermal Systems McGraw-Hill , 1989
7) W .F. Kenney, Energy Conservation in the Process Industries Academic Press, 1984.
8) S. P. Sukhatme, J. K. Nayak, SolarEnergy: Principles of Thermal Collection and Storage,Third Edition, Tata McGraw-Hill, 2008.
9) Arcadio P. Sincero, Gregoria A. Sincero, Environmental Engineering: A Design Approach, Prentice Hall, 1995.
10) Shenoy, U.V. , Heat Exchanger Network Synthesis: Process Optimization by Energy and Resource Analysis, Gulf Publishing Company, Houston, 1995.

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)
Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1606 E4 :ADVANCED ENGINEERING 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

References:

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

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 16 L1 : CAD/CAM LAB

1. Use of CAD/CAM software packages
2. Use of project management software packages
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 conducted by two examiners. A candidate shall secure a minimum of 50 % marks in the aggregate and 50 % minimum in the end semester examination for a pass

ME 16 L2 : 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 conducted by two examiners. A candidate shall secure a minimum of 50 % marks in the aggregate and 50 % minimum in the end semester examination for a pass

ME 1701: 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 - rotary compressors – centrifugal and axial flow 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 - 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 - design of air conditioning systems: duct design - air distribution systems - heating systems

Note: *Refrigeration Data Books are permitted for examination*

References:

1) Dossat, Refrigeration and Air Conditioning
2) Stoecker, Refrigeration and Air Conditioning, Tata McGraw Hill
3) Jordan & Priester, Refrigeration and Air Conditioning, Prentice Hall.
4) Arora, Refrigeration and Air Conditioning, Tata McGraw Hill.
5) Norman Harris, Modern Air Conditioning Practice, McGraw Hill.
6) R C Arora - Refrigeration and Air Conditioning, PHI

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)
Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1702 : VIBRATION AND NOISE CONTROL

Module I

Introduction to mechanical vibrations: Free vibrations, Response of single degree of freedom system, Viscous damping, Under damped, Critically damped and Over damped vibrations, Forced vibrations, Support excited motion, Rotating Unbalance, Coulomb damping

Module II

Multi degree freedom systems: two degree of freedom and three degree of freedom spring mass systems, Matrix formulation, Eigen value problems, Mode shapes, Coordinate Coupling, Lagrange's equations. Torsional vibratory systems, Torsionally equivalent shaft, Two rotor system, Three rotor system, Geared system, Location of Nodes, Frequency of torsional vibration.

Vibration isolation, Measurement of vibration, Accelerometer and Seismometer.

Module III

Transverse vibration of shafts, Whirling speed of shafts, Approximate methods to analyse vibratory system: Rayleigh's energy method, Dunkerleys method.
Vibration of continuous systems: exact methods, boundary value problem, Eigen value problem, Axial vibration of rods, Transverse vibration of beams.

Module IV

Noise, Sound level meter scales, Psychophysical indices, Equivalent sound level, Noise and loss of hearing, Normal hearing and hearing loss, Temporary hearing loss from continuous noise, Permanent haring loss from continuous noise, Physiological effects of noise, Specific effects of noise, Noise exposure limits, Continuous and intermittent noise, Impulse noise, Annoyance of noise, Noise control; control at the source, control at the receiver, control along the path.

References:

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
3. Theory of Vibrations with applications – W. T. Thomson, CBS Publishers
4. Principles of Vibration – Benson H Tongue, Oxford University Press
5. Theory of Vibration – An Introduction – A A Shabana –Springer Intl Edition
6. Principles of Vibration & Sound – T.D Rossing & N.H Flectcher Springer
7. Mechanical Vibrations and Noise Engineering – A.G Ambekar, PHI
8. Mechanical Vibrations– Nag, PHI

Type of Questions for University Exam.
Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)
Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1703: 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

References:

1) J.E.Shigley : Mechanical engineering design, McGraw Hill
2) James G.Bralia :Handbook of product design for manufacturing, McGraw Hill
3) Bhandari : Design of machine elements (TMH)
4) V.I.Doughtie : Design of machine elements – McGraw Hill
5) Siegel, Maleev : Machine design of machines-International and Hartman text book Co.
6) J.Myatt : Machine design, McGraw Hill
7) Sadhu Singh :Machine Design
8) Pandya & Shah :Machine Design
9) Design of machine elements Vol II , T Krishna Rao, IK International Publishing House, New Delhi

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1704: 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 carburettor, constant choke, constant vacuum carburettor, types of carburettor, 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 systems: electrical lighting system, brake lighting system, warning system and indicators

References:

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 Exam.
Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)
Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1705 E1 : 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 manoeuvres, 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.

References:

1) Introduction to flight John D Anderson, McGraw Hill
2) Mechanics of flight: A C Kermode, Pearson Education
3) Aircraft performance selection & Design: Francis J Hale, John Wiley & Sons
4) Aero dynamics for Engg. Students: Houghton & Brock
5) Aerodynamics : MAV Piercy
6) Aerodynamics : Dommesch

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1705 E2 : 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)

References:

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
3) Zenkiewicz O, Finite Element Method, McGraw Hill, International edition
4) Huebner K. H., The Finite Element Method for Engineers, John Wiley.
5) Saeed Moaveni, Finite element analysis Pearson Education
6) S S Rao, The Finite Element Method in Engineering, Elsevier

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1705 E3 : QUALITY ENGINEERING

Module I

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

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

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

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.

References:

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

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1705 E4 : MECHANICAL BEHAVIOUR OF MATERIALS

Module I

Elastic deformation-Description of stress at a point-state of stress in two and three dimensions-stress tensor-Mohr's circle-description of strain at a point-Mohr's circle of strain- hydrostatic and deviator component of stress-elastic stress-strain relations-strain energy-anisotropy of elastic behaviour-rubber elasticity-viscoelasticity-mechanical damping

Module II

Permanent deformation-Flow curve- True stress and true strain-yielding criteria for ductile metals-combined stress tests- yield locus-anisotropy in yielding-yield surface and normality-octahedral shear stress and shear strain-Invariants of stress and strain-Plastic stress –strain relations-Two dimensional plastic flow-slip line field theory

Module III

Dislocations-Edge, screw and mixed dislocations-Properties of dislocations-dislocation stress fields, energies, forces between dislocations, kinks in dislocations, dislocation velocities-Dislocation geometry and crystal structure-slip systems-partial dislocations, interaction of dislocations, dislocation density and macroscopic strain-Plastic deformation in single and polycrystalline materials-initiation of plastic flow in single crystals-stress strain behaviour of single crystals-plastic flow in polycrystals

Module IV

High temperature deformation of crystalline materials- creep mechanism, creep in two phase alloys, independent and sequential processes- deformation mechanism map- Engineering aspects of creep design –creep resistance as related to n\material properties and structure, estimates of creep behaviour, strain rate sensitivity and superplasticity, mechanisms of superplasticity

References:

1) Mechanical Metallurgy GE Dieter Mcgraw-Hill
2) Mechanical Behaviour of Materials TH Courtney Mcgraw-Hill
3) Dieter.GE, *Mechanical Metallurgy,* McGraw – Hill Inc, 2001.
4) Hertzberg, R.W., *Deformation and Fracture Mechanics of Engineering Materials,* 4th ed., John Wiley & Sons, 1995.
5) McClintock, F.A., and Argon, A.S., Mechanical Behavior of Materials, 1st ed., Addison-Wesley Publications, 1966.
6) Reed Hill, R.E., *Physical Metallurgy Principles,* 2nd ed., Affiliated East-West Press, 2008.
7) Honeycombe, R.W.K., *Plastic Deformation of Metals,* 2nd ed., Edward Arnold, 1984.

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 17L1 : HEAT & MASS TRANSFER LABORATORY

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

Practical

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 conducted by two examiners. A candidate shall secure a minimum of 50 % marks in the aggregate and 50 % minimum in the end semester examination for a pass

ME 17 L2 : 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 conducted by two examiners. A candidate shall secure a minimum of 50 % marks in the aggregate and 50 % minimum in the end semester examination for a pass

ME 17L3: 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 17L4 : 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.

ME 1801: COMPRESSIBLE FLUID FLOW

Module I

Introduction to gas dynamics : System and Control Volume approach, Conservation of Mass, Momentum and Energy, Steady Flow Energy Equation, Entropy changes in fluid flow, Stagnation state, Sonic state, Mach number, Effect of Mach number on compressibility, Classification of fluid flow based on Mach number, Acoustic wave propagation speed, Mach cone, Properties of atmosphere.

Isentropic flow with variable area: Isentropic flow of an ideal gas, Comparison of isentropic and adiabatic processes, Mach number variation with Area, Mass flow rate, Critical state, Geometric chocking, Area ratio as a function of Mach number, Impulse function, Isentropic flow through Convergent nozzle and Convergent Divergent nozzle, Isentropic flow through Diffusers.

Module II

Normal Shocks : Fundamental relations for normal shock, Prandtl Meyer relation for normal shock, Rankine-Hugoniot relation for normal shock, Change in entropy across a shock, Impossibility of shock in subsonic flow, Strength of a shock, Variation of flow properties across a normal shock.

Oblique Shocks and Expansion waves : Fundamental relations, Prandtl's relation and Rankine-Hugoniot relation for oblique shock, θ-β-M diagram, Reflected shocks, Variation of flow parameters, Expansion of supersonic flow, Supersonic flow around a convex corner, Prandtl Meyer angle, Mach Waves.

Module III

Fanno flow : Adiabatic flow in constant area duct with friction, Fanno line, Fanno relation for perfect gas, Friction chocking, Variation of Mach number with duct length, Variation of flow properties.

Rayleigh flow : Frictionless flow in constant area duct with heat transfer, Raleigh line, Rayleigh equations for a perfect gas, Thermal chocking, Maximum heat transfer, Variation of flow properties.

Module IV

Methods of flow measurement : Methods of measurement of pressure, temperature, density and velocity, Pitot tube, Prandtl Pitot static tube, Supersonic Pitot tube, Shock tube, Rayleigh Supersonic Pitot formula, Temperature recovery factor, Hot wire anemometer, Working principle of Shadow graph, Velocimeter, Schlieren apparatus and Interferometer, Wind Tunnels – Subsonic and Supersonic Wind tunnels.

Note: ***Gas Tables are permitted for examination***

References:

1) Dynamics and thermodynamics of compressible fluid flow : Shapiro
2) Fundamentals of Compressible Flows : V. Babu, Ane Publishers
3) Compressible fluid flow : Patrick H. Oosthuizen, McGraw Hill
4) Gas dynamics: Yahya, New Age International Publishers.
5) Fundamentals of Compressible Fliuid Dynamics, Balachandran, PHI.

Type of Questions for University Exam.

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5 : Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 60 marks)

ME 1802 : 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: Elements of a hydraulic circuit, JIC symbols hydraulic valves, flow, pressure and direction control valves, 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

Q 1.Eight short answer questions of 5 marks with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5: Two questions A & B of 15 marks from each modules with option to answer either A or B (4x15 = 60 marks)

ME 1803 : 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.

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.

References:

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

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8x5 = 40 marks)

Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B. (4x15 = 60 marks

ME 1804 E1: 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.*

References:

1) Air craft and missile propulsion : Zucrow, D Van Nostrand Company
2) Rocket Propulsion Elements : G P Sutton, John Wiley & Sons
3) Fundamentals of Propulsion : V Babu, Ane Publishers
4) Propulsion Systems : Hosny
5) Aircraft Gas Turbine engine technology :Treager, TMH
6) Gas Turbine Theory : Cohen & Rogers, Pearson
7) Gas Turbines & Jet and Rocket Propulsion : Mathur & Sharma, Standard Pub.
8) Fundamentals of Compressible Flow : Yahya, New Age International.

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8x5 = 40 marks)

Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B. (4x15 = 60 marks

ME 1804 E2 : MATERIALS MANAGEMENT

Module 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

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) Production & Operations Management , Kanishka Bedi: -Oxford University Press

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8x5 = 40 marks)
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B. (4x15 = 60 marks

ME 1804 E3: 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.

Reference:

1) Computational Fluid Dynamics, Anderson
2) Computational Fluid Dynamics for Engineers, Hoffmann Klaus
3) Introduction to Finite Volume Method, Malalasekhar & Veerstag
4) Computational Fluid Flow and Heat Transfer, Sundararajn & Muralidhar, Narosa.
5) Computational Technique for Fluid Dynamics, Fletcher, Springer Verlag
6) Numerical Heat Transfer and Fluid Flow, Patankar Suhas

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8x5 = 40 marks)

Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B. (4x15 = 60 mark)

ME 1804 E4: CRYOGENIC ENGINEERING

Module I

Introduction to Cryogenic Systems, Historical development, Low Temperature properties of Engineering Materials, Mechanical properties-Thermal properties-Electric and magnetic properties –Cryogenic fluids and their properties. Applications of Cryogenics: Applications in space, Food Processing, super Conductivity, Electrical Power, Biology, Medicine, Electronics and Cutting Tool Industry.

Module II

Liquefaction systems: ideal system, Joule Thomson expansion, Adiabatic expansion, Linde Hampson Cycle, Claude & Cascaded System, Magnetic Cooling, Stirling Cycle Cryo Coolers.

Gas liquefaction systems: Introduction -Production of low temperatures-General Liquefaction systems-Liquefaction systems for Neon. Hydrogen and Helium – Critical components of Liquefaction systems.

Module III

Cryogenic Refrigeration systems: Ideal Refrigeration systems-Refrigeration using liquids and gases as refrigerant-Refrigerators using solids as working media, cryogenic fluid storage and transfer systems:

Module IV

Cryogenic Storage vessels and Transportation, Thermal insulation and their performance at cryogenic temperatures, Super Insulations, Vacuum insulation, Powder insulation, Cryogenic fluid transfer systems, Pressure flow-level and temperature measurements – Types of heat exchangers used in cryogenic systems. Cryo pumping Applications.

References

1) Klaus D.Timmerhaus, Thomas M. Flynn, Cryogenic Process Engineering, Plenum Press,
2) New York, 1989.
3) Randal F.Barron, Cryogenic systems, McGraw Hill, 1986
4) R. B. Scott, Cryogenic Engineering
5) J. H. Boll Jr., Cryogenic Engineering

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8x5 = 40 marks)

Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B. (4x15 = 60 marks)

ME 18L1: 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

A committee consisting of the Project Coordinator (appointed by the Head of the Department / Division), project guide and at least one senior faculty member will carry out the assessment based on at least one interim review and a final review just before the submission of the project report.

The final evaluation of the project 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:

1.	Regularity and progress of work	30
2.	Work knowledge and Involvement	100
3.	End semester presentation and oral examination	50
4.	Level of completion and demonstration of functionality/specifications	70
5.	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.

ME 18L2: 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 Head of the Department / Division or his/her nominee and one senior faculty of the Department/Division and an external expert .The examiners except the Head of the Department / Division or his/her nominee shall be, 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.