KANNUR UNIVERSITY
FACULTY OF ENGINEERING

Curricula, Scheme of Examinations & Syllabi for B.Tech Degree Programme (III-IV Semesters) in MECHANICAL ENGINEERING With effect from 2007 Admissions

THIRD SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
2K6ME 301	Engineering Mathematics II	3	1	-	50	3	100
2K6ME 302	Computer Programming	3	1	-	50	3	100
2K6ME 303	Mechanics of Solids	3	1	-	50	3	100
2K6ME 304	Electrical Machines	3	1	-	50	3	100
2K6ME 305	Fluid Mechanics	3	1	-	50	3	100
2K6ME 306	Metallurgy and Materials Science	3	1	-	50	3	100
2K6ME 307(P)	Fluid Mechanics & Machinery Lab	-	-	3	50	3	100
2K6ME 308(P)	Strength of Materials Lab	-	-	3	50	3	100
TOTAL		**18**	**6**	**6**	**400**	**-**	**800**

FOURTH SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
2K6ME 401	Engineering Mathematics III	3	1	-	50	3	100
2K6ME 402	Humanities	3	1	-	50	3	100
2K6ME 403	Thermodynamics	3	1	-	50	3	100
2K6ME 404	Manufacturing Processes	3	1	-	50	3	100
2K6ME 405	Fluid Machinery	3	1	-	50	3	100
2K6ME 406	Machine Drawing	1	-	3	50	3	100
2K6ME 407(P)	Production Engg Lab I	-	-	3	50	3	100
2K6ME 408(P)	Electrical Engineering Lab	-	-	3	50	3	100
TOTAL		**16**	**5**	**9**	**400**	**-**	**800**

2K6ME 301 : ENGINEERING MATHEMATICS II

3 hours lecture and 1 hour tutorial per week

Module I:

Infinite Series: Convergence and divergence of infinite series – Ratio test – Comparison test – Raabe's test – Root test – Series of positive and negative terms- absolute convergence – Test for alternating series. ***Power Series***: Interval of convergence – Taylors and Maclaurins series representation of functions – Leibnitz formula for the derivative of the product of two functions – use of Leibnitz formula in the Taylor and Maclaurin expansions

Module II:

Matrices: Concept of rank of a matrix –echelon and normal forms – System of linear equation - consistency – Gauss elimination– Homogeneous liner equations-Fundamental system of solutions- Inverse of a matrix – solution of a system of equations using matrix inversion – eigen values and eigen vectors - Cayley- Hamilton Theorem.

Module III:

Vector Integral Calculus: Evaluation of line integral, surface integral and volume integrals – Line integrals independent of the path, conservative force fields, scalar potential- Green's theorem- Gauss' divergence theorem- Stoke's theorem (proof of these not required).

Module IV:

Vector Spaces: subspaces–linear dependence and independence–bases and dimension-linear transformations -sums, products and inverse of linear transformations.

References:

1. Kreyszing E. Advanced Engineering Mathematics, Wiley Eastern
2. Sastri. S. S. Engineering Mathematics, Prentice Hall of India.
3. Wylie .C. R. Advanced Engineering Mathematics, Mc Grawhill.
4. B .S. Grewal. Higher Engineering Mathematics, Khanna Publishers.
5. Greenberg. M.D. Advanced Engineering Mathematics, Pearson Education Asia.
6. Narayanan .S. Manickavachagom Pella and Ramaiah. Advanced Mathematics for Engineering Students, S. Viswanathan Publishers

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6ME 302 : COMPUTER PROGRAMMING

3 hours lecture and 1 hour tutorial per week

Module I (15 hours)
Overview of C – Variables, Expressions and assignments, Lexical Elements, Fundamental Data Types, Operators *Control Statements* – if, switch-case, for , while, do, goto, break, switch *Functions*- Parameter passing , scope rules, recursion

Module II (12 hours)
Arrays – One dimensional and Multi Dimensional, *Pointer*-Linked List, Arrays of Pointers, Dynamic Memory Allocations, *Strings* – Operations and functions , *Bitwise Operators and Enumeration Types , Structures and Unions, Files and File Operations*

Module III (13 hours)
Overview of Java Language- Constants, Variables and Data Types, Operators and Expressions *Control Structures* – Decision Making, Branching and Looping, *Object Oriented Programming* – Concept of Classes, Objects and Methods, Benefits Java and OOP-Polymorphism and Overriding of methods, Inheritance

Module IV (12 hours)
Arrays and Strings, Interfaces, Multiple Inheritance, Packages – Putting Classes together – Managing Errors and Exceptions – Applet Programming and Graphics Programming (Basics only) – Managing Input/Output Files in Java

Text books
1. Kelley, Al & Pohl, Ira.,., *A Book on C- Programming in C*, 4th Ed,, Pearson Education (Modules I &II)
2. Balagurusamy E., Programming with Java: A Primer, 3rd Ed., Tata McGraw-Hill (Module III &IV)

Reference books
1. Balagurusamy E., Programming in ANSI C, Tata McGraw Hill
2. Eckel, Bruce., *Thinking in Java*, 2nd Ed, Pearson Education

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern
Q I - 8 **short** type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 ME 303 MECHANICS OF SOLIDS

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Introduction - general concepts - definition of stress - stress tensor - stress analysis of axially loaded members - strength design of members - axial strains and deformations in bars - stress-strain relationships - Poisson's ratio - thermal strain - Saint Venant's principle - elastic strain energy for uniaxial stress - statically indeterminate systems - generalised Hooke's law for isotropic materials - relationships between elastic constants - introduction to anisotropy – orthotropy

Module II (13 hours)

Torsion - torsion of circular elastic bars - statically indeterminate problems - torsion of inelastic circular bars - axial force, shear force and bending moment - diagrammatic conventions for supports and loading, axial force, shear force and bending moment diagrams - shear force and bending moments by integration and by singularity functions

Module III (13 hours)

Bending stresses in beams - bending stresses in beams - shear flow - shearing stress formulae for beams - inelastic bending of beams - deflection of beams - direct integration method - singularity functions - superposition techniques - moment area method - conjugate beam ideas - elementary treatment of statically indeterminate beams - fixed and continuous beams

Module IV (13 hours)

Transformation of stresses and strains (two-dimensional case only) - equations of transformation - principal stresses - mohr's circles of stress and strain - strain rosettes - compound stresses - superposition and its limitations - eccentrically loaded members - columns - theory of columns - buckling theory - Euler's formula - effect of end conditions - eccentric loads and secant formula

Text book

1. Popov E.P., *Engineering Mechanics of Solids,* Prentice Hall of India

Reference books

1. Timoshenko S.P. & Young D.H., *Elements of strength of materials,* McGraw Hill
2. Shames I.H., *Introduction to Solid Mechanics,* Prentice Hall of India
3. Crandall S.H., Dahl N.C. & Lardner T.J., *Introduction to Mechanics of Solids*, McGraw Hill
4. Beer F.P. & Johnston E.R., *Mechanics of Materials,* McGraw Hill

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 **short** type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 ME 304 ELECTRICAL MACHINES

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

DC Generators EMF equation - Armature reaction - Power flow diagram voltage build up- Internal and external characteristics - Control of terminal voltage

DC Motors: Back EMF - Torque and speed equations- Power flow diagram- Losses - components- efficiency- Performance characteristics - Starting method using 3 point starter- Speed control.

Module II (14 hours) .

Transformers: Ideal and real transformer - Equivalent circuit - Phasor diagram - Losses - efficiency and regulation - All day efficiency - OC and SC tests- Auto transformers - Voltage and current relationships - Saving of copper - Three phase transformers- Star and Delta connections .

3 phase induction motors -Production of torque - slip and frequency of rotor current - torque slip characteristics- no-load and blocked rotor tests- equivalent circuit -losses and power flow.

Module III (13 hours)

Starting methods for three phase induction motors - direct on line starting - auto transformer starting - star delta starting - rotor resistance starting

Alternators - Voltage regulation – predetermination - EMF method - MMF method - Synchronizing with 3 phase mains

Control of Permanent magnet stepper motors

Module IV (13 hours)

Electrical drives: advantages of electrical drives - parts of electrical. drives - choice of electric drives - status of DC and AC drives - dynamics of electric drives' - fundamental torque equations - multi-quadrant operation - equivalent values of drive parameters - components of load torque - nature and classification of load torque.

Electrical drives: power semiconductor device- SCR - symbol and characteristics - input-output characteristic of AC to DC,. AC to AC and DC to DC converters (no derivation) - three phase induction motor drives- stator voltage control and slip power recovery scheme.

Text books

1. A Text Book of Electrical Technology- B.L. Thereja, A.K.Thereja for Module 1-3
2. Dubey et.al , Thyristorised power controllers, Narosa publications. for Module 4

Reference books

1. Nagarath I. J. & Kothari. D. P.; Electric Machines, Tata McGraw Hill
2. Stephen J Chapman, Electric Machinery Fundamentals, McGraw Hill.
3. Tara V.D., Electrical Machines & Power Systems, Prentice Hall.
4. Fitzgerald A.E. & Kingsley, Electrical ¥achinery, McGraw Hill.
5. Puchestein, Lloyd & Cenrad, Alternatirig Current Machines, Asia Publishing House.
6. Vincent Del Toro, Electrical Machines and Power Systems, Prentice Hall
7. M.D and Kanchandani K.B., Power Electronics, Tata Mc Graw Hill.

8.Electric Drives – N.K.De and P.K. Sen , Prentice Hall of India.

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 ME 305 FLUID MECHANICS

3 hours lecture and 1 hour tutorial per week

Module 1(15 hrs)

Introduction and basic concepts-distinction between fluids and solids – Application areas of fluid mechanics-Classification of fluid flows-system and control volume. Properties of fluids-Continuum-density and specific gravity-vapour pressure and cavitation-viscosity-surface tension and capillary effects -Pressure -Variation of pressure in a stationary fluid-Manometers.

Fluid static-hydrostatic forces on submerged plane and curved surfaces-Buoyancy and stability. Fluid kinematics-Lagrangian and Eulerian descriptions-Fundamentals of flow visualization-stream lines, stream tubes, path tubes, streak lines. Types of motion -deformation of fluid elements-vorticity and rotationality-Reynolds transport theorem.

Module 2 (14 hrs)

Mass, Bernoullis and Energy equations-Static, Dynamic and Stagnation Pressures-limitation on the use of Bernoulli equation-Hydraulic grade line and Energy grade line-Applications of Bernoulli equation-Flow rate and velocity measurements-Pitot tube and Pitot static probes- Obstruction flow meters-Orifice, Venturi and Nozzle meters-Flow in Pipes-Laminar and turbulent flows- Hagen-Poiseuille equation-Darcy-Weisbach equation-Minor losses-Moody's Chart

Module 3 (12 hrs)

Differential analysis of fluid flow-Conservation of Mass-Derivation of continuity equation- stream function-irrotationality-velocity potential- relationship between stream function and velocity potential in irrotational flows- Conservation of linear momentum-Navier-Stokes equation-Newtonian versus non Newtonian fluids- exact solution of continuity and Navier-Stokes equation. Introduction to Computational Fluid Dynamics.

Module 4 (11 hrs)

Introduction to boundary layer-The boundary layer approximation-boundary layer equations-displacement thickness- momentum thickness-Blasius solution for flow over a flat plate-Momentum integral equation- Flow over bodies- Drag and Lift- Drag and lift coefficients-Friction and pressure drag-Flow separation.

Text book

1. Fluid Mechanics- Yunus A Cengel and John M Cimbala, McGraw Hill

Reference books

1. Fluid Mechanics- White F.M, McGraw Hill
2. Fluid Mechanics- Shames I.H, McGraw Hill
3. Fluid Mechanics and its applications- Gupta V. and Gupta S., Wiley Eastern
4. Introduction to Fluid Mechanics- Fox and Mc Donald- John Wiley and Sons

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 ME 306 : MATERIAL SCIENCE & METALLURGY

(3 Hours Lecture and 1 Hour Tutorial per week)

Module 1(10Hours)
Classification of materials-Properties of Engineering Materials –structure of atoms and molecules – Chemical bonds-primary and secondary or molecular bonds- Bond energy and Activation energy-Crystal structure –Bravai's lattices –BCC,FCC and CPH structures –Atomic packing factor-Miller indices-Interplaner spacing –Xray diffraction –Metallographic-Specimen preparation¿ –metallurgical ,scanning electron microscopes-grain size measurement-etching common etchants used

ModuleII (15Hours)
Defects and Imperfections in crystals –Point defect ,line defects, edge dis location screw dislocation- interaction of dislocations-Frank reed sources –surface imperfections-Diffusion mechanisms-Fick's Laws of diffusion –mechanical behaviour-Elastic ,anelastic and visco elastic materials-plastic deformation mechanisms-slip –twinning-strengthening mechanisms –phases-solid solutions and compounds-Hume- rothery rules-freezing of pure metal-Homogeneous nucleation –Heterogeneous nucleation-crystal growth-cast metal structure

Module III (15 Hours)
Phase diagrams –cooling curves-types equilibrium diagrams-phase diagrams of Cu-Ni ,Bi-Cd ,Pb-Sn; and Fe-C-Important reactions –pertaining to phase diagrams. Liver Rule
Heat treatment of carbon steels-annealing ,normalizing ,hardening ,tempering, austempering and martempering –Hardenability and Jomini test-case hardening surface hardening –metallic coating and surface treatments –failure of material –Creep-Creep resistant materials-fracture-brittle and ductile fracture –protection against fracture –fatigue –fatigue mechanisms-Sn curves

Module IV (12Hours)
Steels-high alloy steels- tool steels-stainless steels- uses of steels
Cast iron –classifications- structure –applications
Copper alloys and their uses
Aluminium alloys and their uses
Materials with medical applications
Ceramic materials –classification and their uses composites and glasses

Text Book:
1. R.K. Rajput, Material Ssience and Engineering, S.K. Khataria and sons

Reference books-
1. Shackle Ford .JF.,Material science for Engineers –Prentice hall
2. Narang.B.S .,Material Science & Processes –-CBS Publishers
3. Van Vlack L.H., Elements of Material Science -Addison-Wesley.
4. M G K Narula ., Material Science--Tata Mc Grow Hill
5. Prof. Kodgire ., Material Science& Metallurgy –-Everest publications
6. Higgins R.A., Engineering Matellurgy Part I., ELBS
7. Raghavan B., Material Science and Engineering, Prentice Hall India.

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern
Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 ME 307(P) : FLUID MECHANICS AND MACHINERY LAB

3 hours Practical per week

Study of plumbing tools and pipe fittings - measurement of meta centric height and radius of gyration of floating bodies - measurement of viscosity of fluids - study of discharge measuring instruments - measurement of pressure and velocity

Calibration of venturi meter - orifice meter - notches and weirs - nozzle meters & Rota meters - pipe friction - minor losses in pipes - verification of Bernoulli's theorem - demonstration of laminar and turbulent flow in pipes - critical velocity - forces on curved and plane surfaces

Evaluation of the performance of turbines - main and operating characteristics - Muschel's curves - performance of pumping and other machinery like centrifugal pumps - reciprocating pumps - gear pumps - hydraulic ram and torque

Sessional work assessment

Lab Practicals and Record		= 30
2 tests	2x10	= 20
Total marks		= 50

2K6 ME 308(P) : STRENGTH OF MATERIALS LAB

3 hours Practical per week

1. Standard tension test on mild steel using Universal Testing Machine and suitable extensometers
2. Stress - strain characteristics of brittle materials - cast iron
3. Double shear test on mild steel specimens
4. Torsion test on mild steel/brass specimens
5. Spring test - open and closed coiled springs - determination of spring stiffness and modulus of rigidity
6. Determination of modulus of rigidity of wires
7. Impact test - Izod and Charpy
8. Hardness tests - Brinnell hardness, Rockwell hardness (B S C scales), Rockwell superficial hardness (N & T scales) & Vickers hardness
9. Bending test on beams
10. Fatigue testing - study of testing machine
11. Photoelastic method of stress measurements (two dimensional problems)

Sessional work assessment	
Lab practicals & record	= 30
2 tests	2x10= 20
Total marks	= 50

2K6ME 401 : ENGINEERING MATHEMATICS III

3 hours lecture and 1 hour tutorial per week

Module I: (13 hours)

Complex analytic functions and conformal mapping: Complex functions – limits. derivative, analytic function- Cauchy-Riemann equations- elementary complex functions such as powers, exponential function, logarithmic, trigonometric and hyperbolic functions- Conformal mapping – Linear fractional transformations- mapping by elementary functions

Module II: (13 hours)

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

Module III: (13 hours)

Jointly Distributed Random Variables: Joint distribution functions, independent random variables , covariance and variance of sums of random variables, joint probability distribution functions of random variables, conditional probability and conditional expectations. ***Curve fitting***: Method of least squares, correlation and regression, line of regression.

Module IV: (13 hours)

Vibrating strings: One dimensional wave equation – D' Alembert's solution – solution by method of separation of variables One dimensional heat equation - solution of the equation by the method of separation of variable Solutions of Laplace's equation over a rectangular region and a circular region by the method of separation of variable

Reference books

1. Kreyszig E. Advanced Engineering Mathematics. Wiley Eastern
2. Johnson, Miller and Freud. Probability and Statistics for Engineers, Pearson Education Asia.
3. Wylie .C.R. Advanced Engineering Mathematics, Mc Grawhill.
4. B.S. Grewal. Higher Engineering Mathematics, Khanna Publishers.
5. Freund. J.E. Mathematical Statistics, Prentice hall of India.

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6ME 402 : HUMANITIES

3 hours lecture and 1 hour tutorial per week

Module I (20 hours)

Functional English Grammar: Sentence Analysis -Basic Patterns -Noun Group, Verbal Group, and Adverbial Group- Tenses – Conditionals - Active and Passive Voice - Reported Speech

Module II (**14 hours**)

Technical Communication

1. Nature, Growing need, and importance of technical communication – technical communication skills – listening, speaking, reading, and writing.
2. Barriers to effective communication – improper encoding, bypassing inter- cultural differences etc.
3. Organization in technical communication – spatial, chronological etc.
4. Style in technical communication - objectivity, accuracy, brevity, clarity etc.
5. Technical reports – types and format

Professional Ethics: 1. Ethics in Engineering, copyright – IPR- patents

Module III (10 hours)

Humanities, Science and Technology

1. Importance of humanities to technology, Education and Society
2. Relevance of a scientific temper
3. Relation between science, society and culture – the views of modern thinkers
4. The development of science and technology in society – science and technology in ancient Greece and India – the contribution of the Arabs to science and technology – recent advances in Indian science.

Reference books

1. Huddleston R, English Grammar – An outline, Cambridge University Press
2. Pennyor, Grammar Practice Activities, Cambridge University Press
3. Murphy, Intermediate English Grammar, Cambridge University Press
4. Hashemi, Intermediate English Grammar, Supplementary Exercises with answers, Cambridge University Press
5. Vesilind; Engineering, Ethics and the Environment, Cambridge University Press
6. Larson E; History of Inventions, Thompson Press India Ltd.
7. Bernal J. D., Science in History, Penguin Books Ltd.
8. Dampier W. C., History of Science, Cambridge University Press
9. Encyclopedia Britannica, History of Science, History of Technology
10. Subrayappa; History of Science in India, National Academy of Science, India
11. Brownoski J, Science and Human Values, Harper and Row
12. Schrödinger, Nature and Greeks and Science and Humanism, Cambridge University Press
13. Bossel. H., Earth at a Crossroads – paths to a sustainable future, Cambridge University Press
14. McCarthy, English Vocabulary in Use, Cambridge University Press
15. M. Ashraf Rizvi, Effective Technical Communication, Tata McGraw Hill, New Delhi, 2005

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 10 short type questions of 2 marks, from Module 1

Q II - 10 questions/topics from module II and III for writing short notes with choice to answer any **seven**

Q III - 2 questions A and B of 15 marks from module III for writing essay with choice to answer any one

Q IV - 2 questions A and B of 15 marks from module III for writing essay with choice to answer any one
Q V - 2 questions A and B of 15 marks from module III for writing essay with choice to answer any one

2K6 ME 403 THERMO DYNAMICS

(3 Hours Lecture and 1 Hour Tutorial per week)

Module I (13hours)
Thermodynamics systems-Description of systems –properties-states, processes and cycles-Thermodynamic equilibrium-forms of energy-equations of state for gasses-compressibility factor –VT,PV,PT, Diagrams pure substances, properties of steam-Temperature and Zeroth law of thermodynamics –Various temperature scale –Temperature measuring instruments

Module II (13 Hours)
First law of thermodynamics –concept of heat and work-First law applied to cyclic processes and Non-cyclic processes-definition of stored energy –open system –general and steady flow-application of first law assess performance

Module III (13hours)
Second law of thermodynamics –thermal energy reservoirs-Kelvin –Planck and Clausius statements and their equivalence-Reversible and Irreversible processes-Reversible cycle-Carnot corollaries- thermodynamic temperature scale –Clausius inequality –concept of entropy-calculation of entropy changes from the Tds equations –availability –reversible work and irreversibility –increase of entropy principle- Helmholtz and Gibbs functions

Module IV (13 hours)

Thermodynamic property relations- Maxwells equations- Clapeyron equation –general relations for internal energy , enthalpy and entropy in terms of p,v,T and specific heats- the Joule Thomson coefficient Δh ,Δu and Δs of real gases- mixtures of gases-analysis –Gibbs-Dallton model- Properties gas mixtures based on Dalton model

Text Book:-
Zemansky .M.W ,Thermodynamics,Mc Graw Hill

Reference Books:-

1) Cengel.Y.A & Boles .M .A, Thermodynamics- An Engineering Approch , Mc Graw Hill
2) Jones .I. B & Dugan .R.E Engineering Thermodynamics, Prentice Hall
3) P K Nag , Engineering Thermodynamics ,Tata Mc Graw Hill
4) J.P Holman –Thermodynamics Mc Graw Hill

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 **short** type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 ME 404 MANUFACTURING PROCESSES

3 hours lecture and 1 hour tutorial per week

Module I: Conventional machining operations (12 hours)

Single point tools – center lathe – lathe operations – Boring – Shaping – Planing – Milling-drilling – grinding – abrasive wheels – centerless grinding – tool materials – machinability

Module II: Non-conventional machining operations (14 hours)

High speed machining – hard machining – high speed grinding – creep feed grinding – low-stress grinding – water-jet machining – abrasive jet machining – chemical machining – electrochemical machining – electric discharge machining – laser beam machining – electron beam machining – electrolytic grinding – plasma arc cutting – applications

Module III: Metal fabrication techniques (12 hours)

Forming operations – forging – rolling – extrusion- drawing – casting – sand casting – die casting – investment casting – continuous casting – miscellaneous techniques – powder metallurgy – welding – thermal processing of metals – annealing processes – Normalizing – Spheroidizing

Module IV: Manufacturing processes of non-metals (14 hours)

Fabrication and processing of ceramics – glass forming – heat treating glasses- fabrication and processing of clay products – hydro plastic forming – slip casting – powder pressing – tape casting – processing of polymers – compression and transfer molding – injection molding – extrusion – blow molding – casting – drawing – processing of composites.

Text Books

1. G Boothroyd,Winston A Knight - "Fundamentals of machining and machine tools" CRC Press,Taylor & Francis Group.

2. Milton C Shaw "Metal cutting principles" , Oxford University Press,2005.

3. Callister Jr, William D "Material Science and Engineering – An Introduction " Wiley India Pvt Ltd.

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6ME 405 : FLUID MACHINERY

3 hours lecture and 1 hour tutorial per week

Module I (13 hrs.)
Classification of fluid machines, stage, stator, rotor- Cylindrical co-ordinate system- integral form of continuity, momentum and energy equations,Concept of relative velocity,velocity vector equation, velocity triangle- Performance indices like power and efficiency, Flow of fluid over flat plate and curved surfaces,fixed and moving,propulsion of ships, rockets and missiles. Dimensional analysis: Rayleigh's method and Buckingham's pi theorem-Principles of modeling and similitude as applied to fluid mechanics problems.

Module II (13 hrs.)
Hydraulic Turbine: Hydro-electric power plant, components, surge tank fore bay, Classification of turbines on various criteria, Pelton turbine, work and efficiency, conditions for optimum performance, Francis and Kaplan turbine components, Euler's turbine equation, work done and efficiency, Draft tube theory, function and efficiency, Cavitation in turbine, turbine setting, Model testing, Derivation of dimensionless numbers, Specific and unit quantities, specific speed, Testing of turbine, characteristic curves, selection criteria, Governing of turbine. .

MODULE III(13 hrs.)
Rotodynamic pumps: whirling of fluid, vortex motion-free and forced vortex, spiral flow, features of rotodynamic and positive displacement pumps .Centrifugal Pump: Working Principle, Classification of centrifugal pump, Volute pump,Turbine pump, Heads, work done by impeller, efficiencies , Pressure rise in impeller, pressure recovery, Head-discharge curve, effect of various losses, Comparison of forward, radial and backward curved blades, surging, Priming of Pump, Cavitation and separation in pump. Model analysis, specific speed, characteristic curves, slurry pump, deep well pump.

MODULE IV(13 hrs.)
Reciprocating Pump: Working principle, single and double acting pump, piston and plunger pumps, multicylinder pumps, Duplex and Triplex pumps. Indicator diagram, effect of acceleration and friction, work done, efficiency, slip, function of air vessel, work saved by fitting air vessel, separation in reciprocating pump, comparison with centrifugal pump.working principle of axial and radial piston pumps,vane pump and gear pump.
Hydraulic Systems: Jet pump, airlift pump, hydraulic ram, Fluid coupling, working principle, torque converter, working principle, Hydraulic accumulator, pressure intensifier, hydraulic press, crane, jack.

REFERENCES:
1. Jagadish Lal ,Hydraulic machines.
2. Bansal,R.K , Fluid mechanics and hydraulic machines, Laxmi Publications.
3. J.F.Douglas, J.M.Gasiorek and J.A.Swaffield, Fluid Mechanics, Addison-Wesley, 1995.
4. B.S.Massey, Mechanics of Fluids, Van Nostrand Reinhold.

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern
Q I - 8 **short** type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 ME 406:MACHINE DRAWING

(1Hour Lecture and 3 Hours Drawing per week)

Module I (8hours) (Two drawing exercises)

Introduction to machine drawing –principles of orthographic projections applied to machine drawing –first angle projection and third angle projection-methods of dimensioning –conversion of pictorial projections in to orthographic projections –sectional views-rules and conventions of sectioning –full sectional, half sectional ,partial sectional and revolved sectional views of simple machine parts –welded joints –types of welds –nomenclature of welds –welding symbols drawing of welded machine parts with details of welding –screwed fastenings- screw thread forms –V and square threads –nomenclature of threads –conventional representation of threads –hexagonal and square threaded bolt and nuts –locking arrangements of nuts –various types of machine screws and set screws –foundation bolts –hook bolt- split bolt –bolt with square plate –rag bolt and Lewis foundation bolt

Module II (16 Hours) (five drawing exercises)

Shaft joints-cotter and pin joints-socket and spigot joint –gib and cotter joint-sleeve and cotter joint-and knuckle joint Couplings- muff couplings , flanged couplings ,flexible couplings ,Oldham's coupling and universal coupling –Parallel and tapered sunk keys –hollow flat saddle keys –feather key and pin key Bearings –solid journal bearing –bush bearing s –Plummer block –foot step bearing and pedestal bearing –bracket and hangers –rolling contact bearings –ball bearings –roller bearings and thrust bearings
Pipe joints –coupler joint-union joint-nipple joint –integral and screwed flanged joints

Module III (20 hours) (six drawing exercises)

Assembly drawings – types –accepted norms –engine parts –piston –connecting rod –eccentric –stuffing box and cross head –Parts of a lathe – tail stock –head stock assembly-tool post and carriage –valves-stop valves-safety valves-check valves-pressure relief valves and flow direction control valves –miscellaneous assemblies-vices-screw jack –jigs and fixtures and assembly of pumps

Module IV (8 hours) (Two drawing exercises)

Limit ,fits and tolerances-nomenclature –classification of fits –systems of fits and tolerances –designation-selection of fits and tolerances
Surface texture-nomenclature of surface texture-designation of surface texture –selection of surface characteristics-indication of surface roughness-Working drawings of simple machine elements-computer aided drafting –elements of computer aided drafting –simple exercises using Auto CAD

Reference Books :-

1) Machine drawing by P.I.Varghese & K.C.John, VIP Publishers
2) Machine Drawing by N.D. Butt Panchal
3) Machine Drawing P S Gill S.K.Kataria & sons
4) Machine Drawing by Narayana. K I,Kannaiah& Reddy. K.V
5) Machine Drawing by Narayana. V. I Mathur .M.C .,Jain brothers

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 **short** type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 ME 407(P) : PRODUCTION ENGINEERING LAB I

3 hours Practical per week

Classifications of machine tools and machining processes - specification of machine tool; power source; centre lathe - general features, parts and functions - machining on centre lathe - cutting tools - materials, types, grinding; cutting variables - selection of speeds, feeds and depth of cut - use of cutting fluids - methods of holding work - lathe operations - turning, thread cutting, drilling, boring, reaming, profile turning, knurling; tolerance and surface finish - CNC machine tools

Exercises

Jobs on centre lathe requiring simple turning, taper turning, knurling, boring and thread cutting

Sessional work assessment		
Lab Practicals and Record		= 30
2 tests	2x10	= 20
Total marks		= 50

2K6 ME 408(P) : ELECTRICAL ENGINEERING LAB

3 hours practical per week

1. a) Determination of voltage-current relation of a linear resistance and incandescent lamp
   b) measurement of high and low resistance using voltmeter and ammeter
2. R, L and 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 wattmeters for balanced load and for three and four wire system
5. Determination of the equivalent circuit of transformer by open and short circuit test - calculation of efficiency and regulation at various loads and power factors.
6. Determination of the regulation of alternator by emf and mmf methods
7. Starting the cage induction motor using star-delta switch and plotting the performance characteristics
8. Conducting the no load and blocked rotor test on cage induction motor - determining equivalent circuit and calculating torque-slip characteristics
9. a) Plotting OCC of DC shunt generator at rated speed - determining the critical resistance. b) Conducting load test on DC shunt generator and plotting external characteristics - deducing internal characteristics
10. Conducting load test on DC series motor and plotting the performance characteristics
11. Study of single phase capacitor start and capacitor run induction motors - plotting speed - voltage relation of single phase fan motor

Sessional work assessment

Lab Practicals and Record		= 30
2 tests	2x10	= 20
Total marks		= 50