UNIVERSITY OF CALICUT

SCHEME AND SYLLABI

FOR

THIRD AND FOURTH SEMESTERS

OF

BACHELOR OF TECHNOLOGY

IN

MECHANICAL ENGINEERING

FROM 2004 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

ME: MECHANICAL ENGINEERING

THIRD SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hours	Marks
EN04 301A	ENGINEERING MATHEMATICS-III	3	1	-	50	3	100
ME04 302	COMPUTER PROGRAMMING IN C	2	-	2	50	3	100
ME04 303	FLUID MECHANICS	3	1	-	50	3	100
ME04 304	MECHANICS OF SOLIDS	3	1	-	50	3	100
ME04 305	MACHINE DRAWING	1	-	3	50	3	100
ME04 306	ELECTRICAL TECNOLOGY	3	1	-	50	3	100
ME04307(P)	**ELECTRICAL TECHNOLOGY LAB**	-	-	3	50	3	100
ME04 308(P)	**MATERIALS TESTING LAB**	-	-	3	50	3	100
TOTAL		**15**	**4**	**11**	**400**	**-**	**800**

FOURTH SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hours	Marks
EN04 401A	ENGINEERING MATHEMATICS-IV	3	1	-	50	3	100
EN04 402	ENVIRONMENTAL STUDIES	3	1	-	50	3	100
ME04 403	THERMODYNAMICS	3	1	-	50	3	100
ME04 404	METALLURGY AND MATERIAL SCIENCE	3	1	-	50	3	100
ME04 405	ADVANCED MECHANICS OF SOLIDS	3	1		50	3	100
ME04 406	FLUID MACHINERY	3	1	-	50	3	100
ME04 407(P)	**FLUID MECHANICS & MACHINERY LAB**	-	-	3	50	3	100
ME04 408(P)	**PRODUCTION ENGINEERING LAB I**	-	-	3	50	3	100
TOTAL		**18**	**6**	**6**	**400**	**-**	**800**

SYLLABI OF THIRD SEMESTER

EN04 301A ENGINEERING MATHEMATICS-III

(Common for all branches except CS and IT)

3 hours lecture and 1 hour tutorial per week

Module I: Linear Algebra

Vector spaces – Linear dependence and independence, and their computation – Bases and dimension – Subspaces – Inner product spaces – Gram-Schmidt orthogonalisation process – Linear transformations – Elementary properties of linear transformations – Matrix of a linear transformation. (Proofs of theorems omitted.)

Module II: Fourier Transforms

Fourier integral theorem (proof not required) – Fourier sine and cosine integral representations – Fourier transforms – Fourier sine and cosine transforms – Properties of Fourier transforms – Singularity functions and their Fourier transforms.

Module III: Probability Distributions

Random variables – Mean and variance of probability distributions – Binomial and Poisson distributions – Poisson approximation to binomial distribution – Hypergeometric and geometric distributions – Probability densities - Normal, uniform, and gamma distributions.

Module IV: Theory of Inference

Population and samples – Sampling distributions of mean and variance – Point and interval estimations – Confidence intervals for mean and variance - Tests of hypotheses - Hypotheses concerning one mean, two means, one variance, and two variances – Test of goodness of fit.

TEXT BOOKS

For Module I

K. B. Datta, *Matrix and Linear Algebra for Engineers*, Prentice-Hall of India, New Delhi, 2003.
(Sections: 5.1, 5.2, 5.3, 5.4, 5.5, 5.8, 6.1, 6.2, 6.3)

For Module II

C R Wylie & L C Barrett, *Advanced Engineering Mathematics (Sixth Edition)*, McGraw Hill.
(Sections: 9.1, 9.3, 9.5)

For Module III

Richard A Johnson, *Miller & Freund's Probability and Statistics for Engineers*, Pearson Education, 2000.
(Sections: 4.1, 4.2, 4.3, 4.4, 4.6, 4.8, 5.1, 5.2, 5.5, 5.7)

For Module IV

Richard A Johnson, *Miller & Freund's Probability and Statistics for Engineers*, Pearson Education, 2000.
(Sections: 6.1, 6.2, 6.3, 7.1, 7.2, 7.4, 7.5, 7.8, 8.1, 8.2, 8.3, 9.5)

REFERENCES

1. Bernard Kolman & David R Hill, *Introductory Linear Algebra with Applications (Seventh Edition)*, Pearson Education, 2003.
2. Lipschutz S, *Linear Algebra – Schaum's Outline Series*, McGraw Hill
3. Erwin Kreyszig, *Advanced Engineering Mathematics (Eighth Edition)*, John Wiley & Sons.
4. Larry C Andrews & Bhimsen K Shivamoggi, *Integral Transforms for Engineers*, Prentice-Hall of India, 2003.
5. Ronald E Walpole, et al, *Probability and Statistics for Engineers and Scientists(Seventh Edition)*, Pearson Education, 2004
6. Robert V Hogg & Elliot A Tanis, *Probability and Statistical Inference*, Pearson Education, 2003.
7. Chatfield C, *Statistics for Technology, Chapman & Hall*

Internal assessment:		
Assignments	(minimum 2)	=15 marks
2 Tests	(2 x 15)	=30 marks
Regularity		= 5 marks
Total		=50 marks

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

ME04 302 COMPUTER PROGRAMMING IN C
(Common for all branches except CS, PT and IT)

2 hours lecture 2 hrs practical per week

Objective: To equip the students for programming needs for the future semesters

Module 1(12 hours)
Programming and problem solving – Basic computer organization – Developing algorithms – Flow charts – High level and low level languages – Compilers and Interpreters – Steps involved in computer programming – Writing, Compiling and Executing a program – Debugging a program – Description of a programming language.

Module II (18 hours)
Basics of C – Overview of C – Program structure – Lexical elements – Numerical constants – Variables – Arithmetic operators – Arithmetic Expressions – Arithmetic conversion – Increment and Decrement operators – Assignment Expressions – Multiple assignments – Input and Output – Format specifiers – Fundamental data types – Bit level operators and applications – Relational operators – Relational expressions – Logical operators – Logical expressions – Conditional operator – Precedence and associativity of operators.

Module III (16 hours)
Compound statements – Conditional statements – if statement – if else statement – nested if statement – switch statement – Loop control statements – while statement - do while statement – for statement – continue statement – break statement – go to statement – Functions – user-defined functions – library functions – Recursion – Global, local and static variables.

Module IV (20 hours)
Arrays – single dimensional – multi dimensional – Arrays in functions – Stacks – Strings – String processing – Bit-wise operators – Enumerated data types – Structures – Typedef – Structures in Arrays – Arrays in Structures – Unions – Pointers – Pointers and Arrays – Pointers and Functions – Linear linked lists and list operations – Files – sequential files – unformatted files – text files.

Text book

Rajaraman V, Computer Programming in C, Prentice Hall of India

Reference books

1. Kernighan, B. W. & Ritchie, D. M., The C Programming Language, Prentice Hall of India
2. Balagurusamy E, Programming in ANSI C, Tata McGraw Hill
3. Venugopal K. R. & Prasad S. R, Programming with C, Tata McGraw Hill

Internal assessment:

Assignments	(minimum 2)	=15 marks
2 Tests	(2 x 15)	=30 marks
Regularity		= 5 marks
Total		=50 marks

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

ME04 303 FLUID MECHANICS
(Common with AM04 303)

3 hours lecture & 1 hour tutorial per week

Objective:
To provide fundamental knowledge on properties of fluids, basic equations in fluid mechanics, fluid statics, fluid kinematics and fluid dynamics including boundary layer theory

Module I
Fundamentals Concepts : Characteristics of fluids – continuum – properties of fluids – density, specific weight, specific volumes, specific gravity, viscosity, capillarity, compressibility, surface tension, vapour pressure.
Fluid Statics : Pressure – variation of pressure in static fluids – absolute and gauge pressures – measurement of high and low pressures – manometers – forces on bodies and surfaces submerged in fluids – stability of bodies submerged and floating in fluids – metacentric height.

Module II
System and control volume approach - basic equations – Reynold's transport equations – differential and integral form of continuity , momentum and energy equations – application of the above equations for one dimensional flow – velocity and momentum corrections - one dimensional flow along streamline and stream tubes - Euler's equation - Bernoulli's equation – applications - Venturimeter, Orificemeter, Pitot tube, Orifice , Mouthpiece, Notches and weirs.

Module III
Fluid Kinematics – Eulerian and Lagrangian flow descriptions – classification of fluid flow – graphical description of flow pattern – stream lines , path lines, streak lines, stream tubes – velocity and acceleration in fluid flow.
Ideal fluids – rotational and irrotational flow – circulation and vorticity – stream function and potential function – basic flow fields – rectilinear flow - source and sink . Flow through pipes – Reynold's experiment - laminar and turbulent flow – critical Reynold's number – laminar flow in circular pipes – Haygen - Poiscille law – turbulent flows in circular pipes – Darcy - Weisbach equations – Eddy properties – Minor losses in pipes – total head - pressure lines .

Module IV
Boundary layer – Introduction –boundary layer over flat plate – continuity and momentum equations for laminar boundary layer – boundary layer thickness – velocity profile – integral solutions of momentum equations – boundary layer on immersed bodies – drag and lift – skin friction – boundary layer separation
Introduction to turbulance, classification, scales of turbulance - Reynold's stresses- turbulance models- Prandtl mixing length concept.

Text Books
Douglas, Fluid Mechanics, Pearson Education
D S Kumar, Fluid Mechanics, S K Kataria & Sons
Reference books
White F M, Fluid Mechanics, 5th Edition, McGraw Hill
Shames I H, Fluid Mechanics,4th Edition, McGraw Hill
S K Som & G Biswas, Fluid Mechanics, Tata McGraw Hill
Fox,Introduction to Fluid Mechanics, Eastern Wiley.
D Ramadingeih, Fluid Mechanics, New Age International

Internal assessment:

Assignments	(minimum 2)	=15 marks
2 Tests	(2 x 15)	=30 marks
Regularity		= 5 marks
Total		=50 marks

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

ME04 304 MECHANICS OF SOLIDS
(Common with AM04 304)

3 hours lecture & 1 hour tutorial per week

Objective:
To provide knowledge on general concepts of stress & strain, theory connected with torsion, bending and transformation of stress and strain

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-Strain tensor-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-Statistically indeterminate problems-Torsion of inelastic circular bars-Axial force, shear force and bending moment-Diagramatic conventions for supports and loading, axial force, shear force and bending moment diagrams- shear force and bending moment diagrams by integration and by singularity functions.

MODULE III (13 hours)
Bending stresses in beams-Shear flow-Shearing stress formulae for beams-Inelastic bending of beams-Deflection of beams-Direction integration method-Singularity functions-Superposition techniques-Moment area method-conjugate beam ideas-Elementray treatment of statically indeterminate beams-Fixed and continuous beams.

MODULE IV (13 hours)
Transformation of stress and strains (two-dimensional case only)-Equations of transformation-Principal stresses-Mohr's circles of stress and strain-Strain Roseettes-Compound stresses-Superposition and its limitations-Eccentrically loaded members-Columns-Theory of columns-Buckling theory-Eulers formula-Effect of end conditions-Eccentric loads and secant formula.

Text Book

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

References

1. Timoshenko S.P&Young D.H.,Elements of strength of materials,McGrawhill
2. Shames I.H.,Introduction to solid Mechanics,Prentice Hall of India
3. Beer F.P.&JohnsonE.R,Mecanics of Materials,McGraw Hill

Internal assessment:

Assignments	(minimum 2)	=15 marks
2 Tests	(2 x 15)	=30 marks
Regularity		= 5 marks
Total		=50 marks

University examination pattern

Part A

Q I - 8 short type questions of 5 marks each, 2 from each module. Minimum 60 % of the questions should be Numerical

Part B

Minimum 90 % of the questions should be Numerical

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

ME04 305 MACHINE DRAWING
(Common with AM04 305)

3 hours drawing & I hour lecture per week

Objective:
To provide knowledge on fundamental concepts of Machine Drawing and drawing exercises on tolerances and fits, bearings, assembly of selected machine tools and machine parts

Module-0 (8 hours - 2 drawing exercises)

a) **Introduction to Machine Drawing**- Principle of multi-view projection applied to machine drawing. The six-plane views in first angle projection. Conversion of pictorial views of simple machine elements to orthographic views. Rules of sectioning and conventions. Types of sectional views. Sectional views of simple machine elements

b) **Threaded fasteners** - Screw threads and their conventional representation. ISO metric thread and square thread forms. Hexagonal and square headed nuts and bolts. Types of screws and bolts used in machine assembly. Introduction to computer aided 2D drafting and 3D modelling. (Only practice, no university examination.)

Module - I (12 hours - 3 drawing exercises)

a) **Joints** - Bolted joints using hexagonal, square and stud bolts and nuts. Nut locking arrangements, foundation bolts-eye end, hook-end, split-end type, rag-end, square plate type and Lewis foundation bolts. Types of cotters and pins. Socket and spigot joint, sleeve and cotter joint, strap joint and knuckle joint.

b) **Couplings and pulleys** -Types of shaft keys and their proportions. Solid and split muff couplings. Flanged couplings- protected and flexible type. Claw coupling. Universal coupling. Flat pulleys. V-pulleys. Stepped cone pulley.
(Sketches are to be drawn for a given size of the machine part, adopting standard proportions)

Module - II (16 hours - 3 drawing exercises)

a) **Tolerances and Fits** - Limits and tolerances of machine parts - Hole system and shaft system of tolerances, designation of fundamental deviation. Types of fits and their selection. Indication of dimensional tolerances and fits on simple machine parts. Geometrical tolerances - recommended symbols - indication of geometrical tolerances on simple machine parts. Surface roughness - Indication of surface finish on drawings. Preparation of shop floor drawings of simple machine parts.

b) **Bearings** - Solid journal bearings, bushed bearings, plummer block and footstep bearings. Types of rolling contact bearings. Conventional representation of ball and roller bearings. Assembly of radial and thrust type rolling contact bearings in housing.
(Scaled drawings of machine parts or their assembly showing dimensional tolerance are to be prepared.)

Module - III (24 hours - 6 drawing exercises)

a) **Assembly of engine and machine tool parts** - Strap end of connecting rod. I.C. engine connecting rod. Piston of four stroke engine. Simple eccentric. Lathe tool post. Lathe tail stock. Four jaw chuck. Drill press vice. Drill jig - post type. Drill jig - indexing type.

b) Assembly of miscellaneous machine parts - Screw jack. Swivel bearing. Crane hook. Pipe vice. Stuffing box. Gate valve. Glob valve. Ball valve. Non return valve. Assembly of the bracket and gland of centrifugal pump. (Scaled drawings of assembled views are to be practiced)

NOTE: *All drawing exercises mentioned above are for class work. Additional exercises where ever necessary may be given as home assignments.*

References:

1. K.C. John - "Machine Drawing" - Jet Publications
2. N.D. Bhutt and Panchal- "Machine Drawing" - Charator Publishing House.
3. P.S. Gill - "A text Book of Machine Drawing" - B.D Kataria & Sons.
4. Luzadder, W. J.- "Fundamentals of Engineering Drawing" Prentice Hall of India.

Sectional work assessment:

Drawing exercises (Best 10)	= 25
2 Tests	= 20
Regularity	= 5
Total marks	= 50

University examination Pattern:

No question from module 0

Q I - Two questions a and b of 20 marks each from module - I, with choice to answer any one.

Q II - Two questions a and b of 30 marks each from module - II, with choice to answer any one.

Q III- Two questions a and b of 50 marks each from module - III, with choice to answer any one.

ME04 306 ELECTRICAL TECHNOLOGY
(Common with AM04 306)

3 hours lecture & 1 hour tutorial per week

Module-I
Three phase induction motors: Types and constructional details - Production of rotating magnetic field - Principle of operation - Slip of induction motor - Starting characteristics - Steady state characteristics - Equivalent circuit, Torque equations - Steady state torque-slip characteristics - Effect of harmonics in the stator voltage - Effect of rotor resistance on the torque-slip characteristics - No-load and blocked rotor tests - Predetermination of steady state characteristics using equivalent circuit - method of starting of induction motors - Comparison between squirrel cage and slip ring induction motors - Single phasing - Application of induction motors

Module-II
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 - Steady-state stability - Load equalization

Module-III
Electrical drives: Power semiconductor devices - Symbol and control characteristics - Input-output characteristic of AC to DC, AC to AC and DC to DC converters –(no derivation and waveforms) - Principle of square wave & PWM inverters - Three phase induction motor drives - Performance characteristics - Stator voltage control - Rotor voltage control - Frequency control - Voltage and frequency control

Module-IV
Synchronous machines: Alternators - Constructional details - Types - emf equation - Armature reaction - Phasor diagram - Regulation by emf method - Operation on infinite bus bar - Effect of change of excitation and fuel input - Synchronous motors - Principle of operation - Methods of starting load angle - Power curve - Damper bars - Hunting - Applications - Servo motors, Stepper Motors

Reference books

1. Hughes E., *Electrical Technology, ELBS*
2. Nazareth & Kothari, *Electrical Machines,* Tata McGraw Hill
3. Langdrorf A.S., *Theory of AC Machines,* McGraw Hill
4. Dubey G.K., *Fundamentals of Electrical Drives,* Narosa
5. Rashid M.H., *Power Electronics,* Prentice Hall of India

Internal assessment:

Assignments	(minimum 2)	=15 marks
2 Tests	(2 x 15)	=30 marks
Regularity		= 5 marks
Total		=50 marks

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

ME04 307(P) ELECTRICAL TECHNOLOGY 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, Land 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 wattmetersfor balanced load and for three and four wire system
5) Determination of the efficiency and regulation of single phase transformer by direct loading
6) Determination of the equivalent circuit of transformer by open and short circuit test - calculation of efficiency and regulation at various loads and power factors
7) Determination of the regulation of alternator by emf and mmf methods
8) Synchronization of alternator to the AC mains and studying the effect of changes in excitation for alternator and power input to 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 test on slip ring induction motor - determining equivalent circuit and calculating torque-slip characteristics
11) Plotting acc of DC shunt generator at rated speed - determining the critical resistance
12) Conducting load test on DC shunt generator and plotting external characteristics - deducing internal characteristics

Internal assessment:	
Practical & record	= 25
Regularity	= 5
Tests	= 20
Total marks	= 50

ME04 308(P) MATERIAL TESTING 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) Spring test - open and closed coiled springs - determination of spring stiffness and modulus of rigidity
4)Determination of modulus of rigidity of wires
5)Hardness tests - Brinnell hardness, Rockwell hardness (B S C scales). Rockwell superficial hardness (N & T scales) & Vickers hardness
6) Impact test - Izod and Charpy
7) Bending test on beams
8) Fatigue testing - study of testing machine
9) Photoelastic method of stress measurements (two dimensional problems)

Internal assessment:	
Practical & record	= 25
Regularity	= 5
Tests	= 20
Total marks	= 50

SYLLABI OF FOURTH SEMSTER

EN04 401A ENGINEERING MATHEMATICS-IV
(Common for all branches except CS and IT)

3 hours lecture and 1 hour tutorial per week

Module I: Functions of a Complex Variable I
Functions of a complex variable – Derivatives and analytic functions – Cauchy-Reimann equations - Laplace equation – Conformal mapping – Exponential function – Trigonometric functions - Hyperbolic functions - Logarithm - Linear fractional transformations

Module II: Functions of a Complex Variable II
Line integral in the complex plane – Cauchy's integral theorem (Proof of existence of indefinite integral to be omitted) – Cauchy's integral formula – Derivatives of analytic functions (Proof to be omitted) - Taylor series – Laurent series – Singularities and zeros - Residues and residue theorem – Evaluation of real integrals

Module III: Series Solutions of Differential Equations
(i) Power series method for solving ordinary differential equations – Legendre's equation and Legendre polynomials – Rodrigue's formula – Generating functions – Relations between Legendre polynomials – Orthogonality property of Legendre polynomials (proof omitted)
(ii) Frobenius method for solving ordinary differential equations – Bessel's equation – Bessel functions – Generating functions – Relations between Bessel functions – Orthogonality property of Bessel functions (proof omitted).

Module IV: Partial Differential Equations
Basic concepts - Classification of linear PDE's –Derivation of the one-dimensional wave equation and the one-dimensional heat equation – Solutions of these equations by the method of separation of variables – Solutions satisfying initial and boundary conditions – D' Alembert's solution of the one-dimensional wave equation – Steady-state two dimensional heat flow.

TEXT BOOK: Erwin Kreyszig, *Advanced Engineering Mathematics* (8th Edition) John Wiley & Sons.

Module 1
Sections: 12.3, 12.4, 12.5, 12.6, 12.7, 12.8, 12.9

Module 2
Sections: 13.1, 13.2, 13.3, 14.4, 15.1, 15.2, 15.3, 15.4

Module 3
Sections: 4.1, 4.3, 4.4, 4.5

Module 4
Sections: 11.1, 11.2, 11.3, 11.4, 11.5.

REFERENCES

1. C R Wylie & L C Barrett, *Advanced Engineering Mathematics (Sixth Edition),* McGraw Hill.
2. Churchill R V, Brown J W & Verhey R F, *Complex Variables and Applications,* McGraw Hill .
3. Pipes L A & Harvill L R, *Applied Mathematics for Engineers & Physicists,* McGraw Hill
4. Michael D Greenberg, *Advanced Engineering Mathematics* (*Second Edition*) Pearson education Asia.
5. Sastry S S, *Engineering Mathematics – Volumes 1 & 2,* Prentice Hall of India

Internal assessment:		
Assignments	(minimum 2)	=15 marks
2 Tests	(2 x 15)	=30 marks
Regularity		= 5 marks
Total		=50 marks

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

EN04 402 ENVIRONMENTAL STUDIES

(Common for all branches)

3 hours lecture & 1 hour tutorial per week

Objective:

The importance of environmental science and environmental studies cannot be disputed. Continuing problems of pollution, loss of forest, solid waste disposal, degradation of environment, loss of bio diversity etc have made everyone aware of environment issues. The objective of this course is to create general awareness among the students regarding these environmental issues.

Module I (12 Hours)

The Multidisciplinary nature of environmental studies

Definition - scope and importance-need for public awareness.

Natural Resources

Renewable and non-renewable resources:

Natural resources and associated problems - forest resources: Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their defects on forests and tribal people. - Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. - Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, case studies - Land resources: Land as a resource, land degradation, man induced land slides, soil crosion and desertification - Role of an individual in conversation of natural resources - Equitable use of resources for sustainable lifestyle.

Module II (14 Hours)

Ecosystems - Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids - Introduction, types, characteristic features , structure and function of the following ecosystem:-Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystem(ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation

Introduction – Definition: genetic, species and ecosystem diversity - Biogeographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, national and local levels - India as a mega-diversity nation – Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wild life, man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Module III (11 Hours)

Environmental Pollution

Definition - Causes, effects and control measures of:- Air pollution - Water pollution - Soil pollution - Marine pollution-Noise pollution -Thermal pollution - Nuclear hazards - Solid waste Management: Causes, effects and control measures of urban and industrial wastes -Role of an individual in prevention of pollution - Pollution case studies - Disaster management : floods, earthquake, cyclone and landslides - Environmental Protection Act - Air (Prevention and Control of Pollution) Act - Water (Prevention and Control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act - Issues involved in enforcement of environmental legislation - Public Awareness

Module IV (10 Hours)

Social Issues and the Environment

From unsustainable to sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people; its problems and concerns,case studies - Environmental ethics: Issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies - Wasteland reclamation - Consumerism and waste products

Human Population and the environment

Population growth, variation among nations - Population explosion – Family welfare Programme - Environment and human health – Pollution hazards, Sanitation and health - Human Rights for clean environment - Value Education - HIV/AIDS-social concern - Women and Child Welfare - Role of information Technology in Environment and human health - Case studies

Field Work (5 Hours)

- Visit to a local area to document environmental assets – river/forest/grassland/hill/mountain
- Visit to local polluted site – Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems – pond, river, hill slopes, etc.

Text books:

1.Clark, R.S. Marine Pollution. Clanderson Press Oxford
2.Mhaskar A.K, Matter Hazardous. Techno-science Publications
3.Miller, T.G. Jr. Environmental Science. Wadsworth Publishing Co.
4.Townsend, C., Harper, J. and Michael Begon, Essential of Ecology. Blackwell Science
5.Trivedi. R.K. and Goel . P.K. Introduction to air pollution. Techno – Science Publications

References:

1. Agarval. K.C.2001 Environmental biology. Nidi Publ. Ltd. Bikaner
2. Bharucha Erach, Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email: mapin@icenet.net
3. Brunner, R.C. 1989. Hazardous Waste Incineration. McGraw Hill Inc. 480p
4. Cunningham, W.P., Cooper, T.H., Gorhani, E & Hepworth, M.T. 2001Environmental encyclopedia Jaico publ. House Mumbai 1196p
5. De, A.K. Environmental Chemistry. Wiley Eastern Ltd.
6. Down to Earth, Centre for Science and Environment
7. Gleick, H.P. 1993. Water in crisis. Pacific Institute for Studies in Dev., Environment and security, Stockholm Env. Institute. Oxford Univ. Press. 473p
8. Hawkins, R.E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay
9. Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
10.Jadhav, H. & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi
11. Mckinney, M.L. & School, R.M. 1996. Environmental Science system & Solutions, Web enhanced edition, 639p.
12.Odum, E.P. 1971. Fundamentals of Ecology. W.B.Saunders Co. USA, 574p
13. Rao, M.N. & Datta, A.K 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd., 345p
14.Sharma, B.K. 2001. Environmental Chemistry. Goel Publ. House, Meerut.
15. Survey of the Environment, The Hindu (M)
16.Trivedi, R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol I and II . Enviro Media
17.Wagner.K.D. 1998. Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p
(M) Magazine

Internal assessment:

2 Tests	= 20
Field work and Report (Internal Assessment)	= 25
Regularity	= 5
Total marks	= 50

UniversityExamination Pattern :

Q I- 16 short answer questions (4 from each module) of 5 marks each with a choice to answer any 12 (12X5)
Q II - 2 questions A and B of 10 marks from module I with choice to answer any one
Q III - 2 questions A and B of 10 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 10 marks from module III with choice to answer any one
Q V - 2 questions A and B of 10 marks from module IV with choice to answer any one

ME04 403 THERMODYNAMICS

3 hours lecture & 1 hour tutorial per week

Objective:
To provide knowledge on basic concepts of thermodynamics, the laws of thermodynamics, thermodynamic relations and thermodynamics of combustion.

Module I (13 hours)
Basic concepts and definitions – system and control volume, state, properties. processes and cycles – work and heat – thermodynamic equilibrium – zeroth law law of thermodynamics – temperature scales.
First law of thermodynamics – joule's experiment – first law applied for a change of state – internal energy and enthalpy – first law applied for open system – steady flow energy equation – applications.

Module II (13 hours)
Second law of thermodynamics – Kelvin Planks and Clausius statements and their equivalence – heat engine – heat pump – thermal reservoir – Carnot cycle – Carnot theorems – thermodynamic temperature scale – Clausius inequality – reversible and irreversible process – entropy – principle of entropy increase application of second law for open system – availability and irreversibility - Gibb's , Helm holtz function- third law of thermodynamics.

Module III (13 hours)
Thermodynamic relations – maxwell's relation – Clausius clapeyron equation – Tds relations – equation for internal energy and enthalpy. Joule Thomson coefficient – mixture of gases – Dalton's law, Amagal's law-entropy change of mixture- properties of atmospheric air-Use of psychrometric chart.
Properties of pure substance – P-T, T-S and T-V diagrams – use of steam tables and mollier diagram – properties of real gases – compressibility chart – law of corresponding states.

Module IV (13 hours)
Thermodynamics of combustion – combustion reaction of common fuels – air fuel ratio – exhaust gas composition – flue gas analysis – air fuel ratio from exhaust gas composition – enthalpy of formation – application of first law of thermodynamics to chemically reacting systems-enthalpy and internal energy of combustion- adiabatic flame temperature.

Text book
1. . P. K. Nag, Thermodynamics, Tata Mc Graw Hill
Reference books
1. Yunus Cengel, Thermodynamics an Engineering Approach, Fourth Edition, Mc Graw Hill
2. C. P. Arora, Thermodynamics, Tata Mc Graw Hill
3 . Y V C Rao ,An Introduction To Thermodynamics Unversities Press .
4. R. Yadav, A Text book on Thermodynamics, Central Publishing House
5. Sonntag and Van Wylen, Fundamentals of Thermodynamics, Sixth edn John Wiley & Sons.

Internal assessment:

Assignments	(minimum 2)	=15 marks
2 Tests	(2 x 15)	=30 marks
Regularity		= 5 marks
Total		=50 marks

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

ME04 404 METALLURGY AND MATERIAL SCIENCE
(Common with AM04 404)

3 hours lecture & 1 hour tutorial per week

Objective:
To provide knowledge on classification of Engineering Materials, deformation of crystals, equilibrium diagram of selected alloy systems, heat treatment of steels, properties of steels, cast irons, and alloys of copper and aluminium

Module I (12 hours)
Classification of Engineering materials – properties of engineering materials – levels of structure – macro structure – micro structure – crystal structure – electronic and nuclear structures – crystallography of metals – crystal systems – miller indices – crystal directions and planes – BCC , FCC and CPH structures – automatic packing factor – structure determination – study of micro structure – surface preparation for metallographic examination – etching and common etchants – metallurgical microscope – electron microscope – X ray diffraction techniques -Metallic bonds – polymorphism and allotropy .

Module II (15 hours)
Deformation of crystals – slip and twinning– Von mises and Hencky theory – slip lines - slip bands – critical resolved shear stress imperfections in solids – point defect – line defect – surface defects – volume defects – electronic defects – Edge dislocation and screw dislocation – Sources of dislocation – Frank Reid source – Crystallization of metals – Cast metal structures – Recovery and recrystallysation - grain growth – strain hardening-hot working and cold working - failure of materials– mechanism of creep - creep resistant materials – fracture – brittle and ductile fracture – protection against fracture – Fatigue mechanism – S-N curve.

Module III (15 hours)
Diffusion – patterns of diffusion – equilibrium diagrams – phases – structural constituents – solid solutions – types of solid solutions – HumeRothery rules – thermal equilibrium diagrams – Glibbs phase rule- Cooling curves – lever rule – isomorphous system - Cu-Ni, Bi-Cd; Pb-Sn and Iron-Carbide equilibrium diagram – heat treatment of steels – annealing – normalizing- spheroidising – time temperature – transformation diagram – hardening – hardenability –factor affecting hardenability - austempering and martempering - tempering of steel – precipitation hardening – case hardening – nitriding – surface treatment methods – induction hardening – flame hardening .

Module IV (12 hours)
Steels – Functions of alloying elements in steel – tool steels – stainless steels – cast iron – grey , white and S.G. Castirons - structure of cast iron – copper alloys and their uses – aluminium alloys and their uses – glasses – types of glass- forming agents- Composites – types – application – recent dvelopments in materials – smart materials –Nanomaterials - shape memory alloys.

Textbooks
1.Raghavan " Material science and Engineering" – Printice Hall of India
2.Higgins R A " Engineering Metallurgy "– Part I applied physical metallurgy;ELBS
Reference:
1. A G Guy
2. Allen Cottell

Internal assessment:

Assignments	(minimum 2)	=15 marks
2 Tests	(2 x 15)	=30 marks
Regularity		= 5 marks
Total		=50 marks

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

ME04 405 ADVANCED MECHANICS OF SOLIDS

3 hours lecture & 1 hour tutorial per week

Objective:
To impart knowledge on basic equations of elasticity, two-dimensional problems in elasticity, and problems in bending and torsion of non-circular prismatic bars.

Module I (13 hours)
Basic equations of elasticity - Stress at a point - Nature of stress at a point - Stress tensor - Stress transformation - Principal stresses and planes - Strain at a point - Strain tensor analogy between stress and strain tensors - Constitutive equations - Generalized Hook's law - Equations of equilibrium - Strain displacement relations - Compatibility conditions - Boundary conditions

Module II (13 hours)
Two dimensional problems in elasticity - Plain stress and plain strain - Airy's stress function - Solution by polynomial - Equations in polar co-ordinates - Stress concentration - Axisymmetric problems - Thick cylinders Inference fit - Rotating disks- equilibrium equations.

Module III (13 hours)
Special problems in bending - Unsymmetrical bending - Shear centre - Energy methods in elasticity - Strain energy - Principle of virtual work - Reciprocal theorem - Castigliano's first and second theorems - Complementary energy

Module IV (13 hours)
Torsion of non-circular prismatic bars - Saint Venant's theory - Solution for simple cases - Prandtl membrane analogy - Open and closed sections - Shear flow

Text book
1. Srinath L S, Advanced strength of Materials, McGraw Hill

Reference books
1. Den Hartog J P, Advanced Strength of Materials, McGraw Hill
2. Timoshenko S P & Goodier J N, Theory of Elasticity, McGraw Hill
3. Filonenoko M & Borodich, Theory of Elasticity , Mir Publishers
4. Wang C K, Applied Elasticity, McGraw Hill

Internal assessment:

Assignments	(minimum 2)	=15 marks
2 Tests	(2 x 15)	=30 marks
Regularity		= 5 marks
Total		=50 marks

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

ME04 406 FLUID MACHINERY
(Common with AM04 406)

3 hours lecture & 1 hour tutorial per week

Objective:
To provide information on continuity, momentum and energy equations, Eulers turbine equation, theory of turbines, and roto dynamic and reciprocating pumps and other selected hydraulic machines

Module I (13 hours)
Integral form of continuity, momentum and energy equations- Flow of fluids over flat plates and curved surfaces- Force, work done and efficiency- Reaction principles- Propulsion of ships-Dimensional analysis- Rayleigh's method and Buckingham'Pi' theorem- Principles of modeling and similitude as applied to fluid mechanics problems- Non-dimensional parameters in fluid mechanics and fluid machinery.

Module II (13 hours)
Euler's turbine equation- Analysis of turbines- classifications of turbines - Constructional features of Pelton, Francis and Kaplan turbines- Speed regulation of turbines- Study of performance - Model studies- Theory of draft tubes- Cavitation in turbines.

Module III (11hours)
Rotodynamic pumps - Whirling of fluid - Vortex motion - Free and forced vortex - Spiral flow - Features of rotodynamic and positive displacement pumps - Constructional features of centrifugal pumps - Principle of working - Analysis - Euler's equation - Efficiencies - Types of centrifugal pumps - Pump characteristics - Pump selection - Model studies - Cavitation in pumps – design of pumps – design criteria – selection of pumps – criteria for selection – determination of power of pumps.

Module IV (15 hours)
Reciprocating pumps - Principle of working - Effect of accelaration and friction - Use of air vessels - Cavitation - Pump characteristics - Working principle of axial and radial piston pumps, vane pump and gear pump - Miscellaneous fluid devices - Fluid transients - Analysis of transients in fluid flow - Operation of hydraulic ram and surge tank . Deep well, submersible pumps, screw pump, jet pump – hydraulic break – fluid coupling - Intensifier and accumulator - Application to hydraulic devices (descriptive study only)

Text book
Jagdish Lal, Hydraulic Machines, Metropolitan
Reference books
Govinda Rao, Fluid Flow Machines, Tata McGraw Hill
Shepherd D G, Principles of Turbo Machinery, McMillan
Stepanof A J, Centrifugal and Axial Flow Pumps, John Wiley
Binder R C, Advanced Fluid Mechanics- Vol.1, Prentice Hall

Sessional work assessment
Two Tests = 30
Two Assignments = 15
Regularity = 5
Total marks = 50
University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15marks each from module IV with choice to answer any one

ME04 407(P) FLUID MECHANICS & MACHINERY LAB

3 hours practical per week

1) Study of plumbing tools and pipe fittings
2) Measurement of Metacentric height and radius of gyration of floating bodies
3) Measurement of Viscosity of fluids
4) Study of discharge measuring instruments
5) Measurement of pressure and velocity
6) Calibration of ventprimeter
   Orifice meter
   Notches and weirs
   Nozzle meters
   Rotameters
7) Pipe friction - Minor losses in pipes - Verification of BemoulJis theorem
8) Demonstration of laminar and turbulent flow in pipes - Critical velocity
9) Demonstration of Forces on curved and plane surfaces
10) Evaluation of torque & performance of turbines - operating characteristics - Muschel's curves
11) Performance of pumps
   Centrifugal pumps
   Reciprocating pumps
   Gear pumps
   Hydraulic ram
   Torque Coverter

Internal assessment:	
Practical & record	= 25
Regularity	=5
Tests	= 20
Total marks	= 50

ME04 408(P) PRODUCTION ENGINEERING LAB-I

3 hours laboratory per week

1) Study of Machine tools and machining processes - Specification of machine tools; power sources.
   a) Lathes
   b)Shaper
   c)Planer
   d)Slotting Machine
   e) Drilling Machine
   f) Milling Machine
   g) Grinding Machine
   h) Power saws

2) Study of Centre lathe - General features, parts and functions –Different machining operations on centre lathe - turning, taper turning , thread cutting ,. drilling, boring, reaming , tapping , profile turning , knurling .

3) Study of Lathe cutting tools – Tool materials – HSS – HCS - Carbide ..

4) Study of Tolerances and surface finish – Measuring Tools and Gauges .

7) Exercises: on centre lathe requiring simple turning , taper turning , knurling , boring and thread cutting

Internal assessment:	
Practical & record	= 25
Regularity	=5
Tests	= 20
Total marks	= 50