UNIVERSITY OF CALICUT

SCHEME AND SYLLABI

FOR

THIRD AND FOURTH SEMESTERS

OF

BACHELOR OF TECHNOLOGY

IN

PRODUCTION ENGINEERING

FROM 2004 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

PE: PRODUCTION ENGINEERING

THIRD SEMESTER

Subject Code	Subject	Hours/Week			Internal Marks	University Examination	
		L	T	P/D		Hrs	Marks
EN04 301A	ENGINEERING MATHEMATICS-III	3	1	-	50	3	100
PE04 302	COMPUTER PROGRAMMING IN C	2	-	2	50	3	100
PE04 303	METALLURGY AND MATERIAL SCIENCE	3	1	-	50	3	100
PE04 304	MECHANICS OF SOLIDS	3	1	-	50	3	100
PE04 305	MACHINE TOOL TECHNOLOGY	3	1	-	50	3	100
PE04 306	ELECTRICAL ENGINEERING	3	1	-	50	3	100
PE04 307 (P)	**PRODUCTION ENGG. DRAWING**	-	-	3	50	3	100
PE04 308 (P)	**MACHINE TOOL LAB - I**	-	-	3	50	3	100
TOTAL		**17**	**5**	**8**	**400**		**800**
***At least two industrial visits and subsequent report presentation compulsory** ***Type of Industry -Preferably Machine Tool/Assembly units**							

FOURTH SEMESTER

Subject Code	Subject	Hours/Week			Internal Marks	University Examination	
		L	T	P/D		Hrs	Marks
EN04 401A	ENGINEERING MATHEMATICS-IV	3	1	-	50	3	100
EN04 402	ENVIRONMENTAL STUDIES	3	1	-	50	3	100
PE04 403	THEORY OF MECHANISMS	3	1	-	50	3	100
PE04 404	FLUID MECHANICS AND MACHINERY	3	1	-	50	3	100
PE04 405	THERMAL ENGINEERING	3	1	-	50	3	100
PE04 406	ELECTRONICS AND MICROPROCESSORS	3	1	-	50	3	100
PE04 407 (P)	**MACHINE TOOL LAB – II**	-	-	3	50	3	100
PE04 408(P)	**ELECTRICAL AND ELECTRONICS LAB**	-	-	3	50	3	100
TOTAL		**18**	**6**	**6**	**400**		**800**
***At least two industrial visits and subsequent report presentation compulsory** ***Types of Industry – Preferably Power Plant/Hydro electric/Thermal power plants/Machine Tool**							

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 work assessment 60 % - Test papers (minimum 2) 30 % - Assignments/Term project/any other mode decided by the teacher 10 % - Other measures like Regularity and Participation in Class. Total marks = 50

University examination pattern

Q1	- 8 short type questions of 5 marks, 2 from each module
QII	- 2 questions of 15 marks from module I with choice to answer any one
QIII	- 2 questions of 15 marks from module II with choice to answer any one
QIV	- 2 questions of 15 marks from module III with choice to answer any one
QV	- 2 questions of 15 marks from module IV with choice to answer any one

PE04 302 COMPUTER PROGRAMMING IN C
(Common for all branches except CS, IT & PT)

2 hours lecture & 2 hours practical per week

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

Internal work assessment
60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q1	- 8 short type questions of 5 marks, 2 from each module
QII	- 2 questions of 15 marks from module I with choice to answer any one
QIII	- 2 questions of 15 marks from module II with choice to answer any one
QIV	- 2 questions of 15 marks from module III with choice to answer any one
QV	- 2 questions of 15 marks from module IV with choice to answer any one

PE 04 303 METALLURGY AND MATERIAL SCIENCE

3 hours lecture and 1 hour tutorial per week

Objectives

A basic knowledge on Metallurgical aspects of materials and its properties is required for a production engineer. This course gives a preliminary knowledge on materials and their structures, and instruments and techniques used for Material characterization.

Module I (13 Hours)

Classification of engineering materials
Crystal Structures – Space Lattices – Crystallographic planes and directions – Metallic Structures – Ionic Structures – Covalent Structures – Polymorphism – Imperfections in Solids: - Point defects – line defects – Dislocation theory – Edge and screw dislocations.

Module II (13 Hours)

Crystallization of metals – Nucleation – Crystal growth – equiaxial and dendritic grains –grain boundaries- recovery and recrystallization – Solid solutions – Diffusion mechanism - Strengthening mechanism: – Solid solution strengthening – Strengthening due to point defects –Strain hardening.

Module III (13 Hours)

Phase Transformations :- Liquid-Solid Transformation – Glass transition temperature –Equilibrium diagrams – systems and phases – phase rule – Equilibrium diagram of binary system – Eutectic, Peritectic and Eutectoid reactions – Iron-Carbon diagram– Introduction to ternary system.

Module IV (13 Hours)

Structure determination – Study of microstructure – surface preparation – specimen preparation – Metallurgical Microscope – Introduction to :- Electron Microscope – Scanning Electron Microscope(SEM) – Transmission Electron Microscope(TEM) –Bragg's law – Introduction to X-ray diffraction(XRD) .

Reference books :-

1. William D. Callister, Material Science and Engineering, John Wiley and sons Inc.
2. George.E.Diter, Mechanical Metallurgy, Mc Graw Hill
3. Sir.Allan Cottrel, An Introduction to Metallurgy, University Press
4. R.A.Higgins, Engineering Metallurgy applied to physical Metallurgy, VIVA(Low Priced)
5. B.D.Cullity, Elements of X-ray Diffraction, Addison-Wesley publishing Co.

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one
(QII – V can have at least 2 subdivisions. Preferably all questions are of descriptive type)

PE04 304 MECHANICS OF SOLIDS

3 hours lecture and 1 hour tutorial per week

Objectives

The student is expected to get familiar with the concept of stress, strain, strength etc of materials and how this information can be used to evaluate or design engineering components so as to have safer designs. This paper should also serve as a primer for the student to learn plasticity and metal forming.

Module I (14 Hours)

Introduction - General concepts - Definition of stress – Stress Tensor – Stress Analysis of Axially loaded members – Strength design of members – Axial strains and deformation in bars - Stress Strain relationships – Poisson's Ratio – Thermal strain – Saint Venant's principle – Elastic strain energy for Uniaxial stress – Statistically indeterminate systems – Strain tensors – generalized Hooke's law for isotropic materials – Relationships between elastic constants – introduction to anisotropy – Orthotropy

Module II (12 Hours)

Torsion. - Torsion of circular elastic bars – statistically indeterminate problems – torsion in inelastic circular bars – axial force, shear force and bending moment – diagrammatic conventions for support and loading, axial force, shear force and bending moment diagrams – shear force and bending moments by integration and by singularity functions

Module III (12 Hours)

Bending stresses in beams – shear flow - Shearing stress formula 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 statistically indeterminate beams – fixed and continuous beams

Module IV (14 Hours)

Transformation of stresses and strains (Two-dimensional case only) -. Equation of transformation - Principal stresses – Mohr's Circles of stress and strain – strain rosettes – compound stresses – superposition and it's limitations – eccentrically loaded members – columns – theory of columns – buckling theory – Euler's formula – effect of end conditions – eccentrically loaded and secant formula

Text books

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

References

1. Timoshenko S.P. & Young D.H., Elements of Strength of Materials, McGraw Hill
2. Shames I.H., Introduction of Solid Mechanics, Prentice hall 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
5. S.S.Bhabikatti., Strength of Materials, Vikas

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher. (At least one assignment should be computer based using spread sheet or suitable tools)
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one
(QII to V can have 2 subdivisions. At least 50% weightage for numerical problems.)

PE 04 305 MACHINE TOOL TECHNOLOGY

3 hours lecture and 1 hour tutorial per week

Objectives

A production Engineer is expected to have basic knowledge of machine tools. The subject covers different types of machine tools, as regards to their constructional features, mechanisms, accessories, attachments and the operations carried out .

Module I (14 hours)

Lathe - Different classifications - constructional features - driving mechanisms - tool and work holding devices - operations - speed, feed, depth of cut and machining time calculations – specifications - Capstan, turret and automatic lathes - constructional features - tool layout - tool and work holding devices - operations

Module II (14 hours)

Abrasives and abrasive tools - types of abrasives and their properties - manufacture of grinding wheels - types of bond, grit, grade, structure - nomenclature of a grinding wheel - selection of a grinding wheel, dressing truing and balancing of grinding wheels - Grinding machines - classification of grinding machines - constructional features - tool and work holding devices - operations - cylindrical, surface, centreless, thread, form, tool and cutter grinding – specifications - Surface finishing lapping, honing, super finishing -equipments - tolerance and finish, buffing - applications.

Module III (12 hours)

Milling, Drilling and boring machines - Classification - constructional features - driving mechanisms - tool and work holding devices - types of tools - operations – specifications - Gear generation methods - Gear shaping, gear hobbing, gear shaving, gear grinding, gear lapping - bevel gear generators

Module IV (12 hours)

Shaper, planer, slotter and broaching machines - Different types and their field of application - constructional features - driving mechanisms - tools used - tool and work holding devices - operations – specifications

Reference Books :-

1. Lindberg. - Processes and materials for manufacture., Prentice Hall.
2. Chapman. - Workshop technology : Vol. II, III, ELBS
3. Hajra Choudhary, - Elements of workshop technology: Vol. II, Media Promoters & Publications

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments ,Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one
(QII to V can have 2 subdivisions. Preferably all questions are of descriptive type..)

PE04 306 ELECTRICAL ENGINEERING

3 hours lecture and 1 hour tutorial per week

Objectives

To provide an exposure to the basic electric engineering concepts and theories useful to an engineer in an actual factory environment..

Module I (13 hours)

A.C.Circuits - single phase a.c. circuits - Simple RLC circuits and parallel circuits - concept of impedance and admittance - Real, reactive and apparent power - power factor - poly phase circuits - balanced three phase systems - current and voltage relationships - power in three phase systems - two wattmeter method of measuring three phase power - Single-phase transformers - construction principle of operation - e.m.f equation - equivalent circuit - O.C. and S.C test - efficiency - regulation.

Module II (12 hours)

D.C.Machines - D.C. generators - construction details - e.m.f equation - Method of excitation - magnetisation and load characteristics - d.c.motors - principle of operation - torque and speed equations - back e.m.f. - Performance characteristics and applications of shunt, series and compound motors. - Starting - brake test - D.C. variable speed drives for industrial machinery and machine tool main drives.

Module III (15 hours)

Synchronous machines - construction details - types - e.m.f equation - (winding factor need not be derived) - synchronous impedance - regulation by e.m.f method - synchronous motors - principle of operation - torque equation - toque slip characteristics - starting and speed control - applications.

Module IV (12 hours)

Single-phase induction motors - capacitor start motors - capacitor start and run motors - applications - universal motor - stepper motors - Electric drives - group and individual drive - selection of drives for general factory- textile mills - steel mills - printing press - mines - hoists - cranes - ship propulsion.

Reference Books :-

1. H.Cotton, Electrical technology, ELBS
2. S.K.Pillai, First course on Electrical Drives, Wiley Eastern

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one
(QII to V can have 2 subdivisions.)

PE04 307(P) PRODUCTION ENGINEERING DRAWING

3 hours per week

Objective

The objective of this subject is to expose and train the students to basic standards and concepts in Production/Machine Drawing. Also to enable the students to represent machine components/ assembly in paper with all relevant information. This will help them in translating design concepts in to drawing and also to analyse the drawings provided to them.

Module I

Sketching:-

Preparation of freehand, dimensioned sketches of the following. Hexagonal bolt and nut with washer - Square headed bolt - Common types of bolts- various types of nuts for locking - locking of bolt head - foundation bolts - various types of screw heads - studs - various types of keys - pipe joints and fittings.

Module II

Joints: cotter, knuckle, spigot and socket, flanged coupling , and universal coupling, muff coupling.

Preparation of drawings

Bearings. : Footstep - Plummer block, swivel, self-aligning ball bearing, and stuffing box.

Valves - simple stop valve and non-return valve.

Module III

Production machines and jigs.

Lathe tailstock, chuck, tool post, bench vice and machine swivel vices, and jigs for milling and drilling, drill holder.

Reference Books:-

1. P.S.Gill, S.K. Kataria ,Text Book Of Machine drawing.
2. N.D.Bhatt, Machine drawing, Charotra Pub
3. Laxmi narayana, Machine drawing
4. N.Sidheswar, Machine drawing, Tata McGraw Hill

Internal work assessment

50 % - Test papers (minimum 2)
40 % - Drawing exercises(minimum 10 sheets).
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 4 Questions of 15 marks each for free hand sketching from section I with choice to answer any two

Q II - 2 Questions of 70 marks from section II and III with choice to answer any one (maximum 3 views)

PE04 308 (P) MACHINE TOOL LAB – I

3 hours per week

1. Study of different types of lathes - machine specifications - process capability – centre – capstan - turret and automatic lathes and their accessories – chucks – faceplate - steady rest - follower rest - tool post -centre collets
2. Selection of cutting parameters - speed, feed and depth of cut based on work - tool combination - coolant types.
3. Exercise on plain - step, taper turning and eccentric turning.
4. Screw cutting - external threads – multi start thread cutting.
5. Inspection and measuring of machined lathe components using vernier caliper – micrometer - thread plug and ring gauges - dial indicators and surface finish measuring instruments.
6. Turret lathe and copying lathe operation/ demonstration.

[Note :- At least Six Models To Be Prepared]

Reference books.

1. Chapman, Workshop technology (part II), ELBS
2. Lindberg ,Processes and materials of manufacture, Prentice Hall of India
3. H.M.T, Production technology. -., Tata McGraw Hill
4. Tool Engineering handbook - ASTME.
5. Fundamentals of tool design - ASTME.

Internal work assessment

Workshop Practicals & Record	= 25
Test	= 20
Regularity in Class	= 5
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 work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher. (At least one assignment should be computer based using spread sheet or suitable tools)
10 % - Other measures like Regularity and Participation in Class.
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

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

PE04 403 THEORY OF MECHANISMS

3 hours lecture and 1 hour tutorial per week

Objective

The objective of the subject is to equip the student to apply the basic theory of Engineering Mechanics to actual engineering analysis. The student is expected to analyse different machineries for their performance. This exposure and understanding will help them in designing new machines to satisfy stated requirements. This will also be a primer for the student to learn Dynamics of Machinery at a higher level.

Module I (16 hours)

Plane motion of rigid bodies- kinematics of plane motion-instantaneous centre-equations of plane motion-D'Alemberts principle in plane motion-principle of angular momentum in plane motion-energy equations for plane motion

Introduction :- definition and explanations of link - kinematic pair - mechanism and machine - Kinematic chains – classification - Inversions of four bar - single slider and double slider crank chains - Slotted lever and Whitworth quick return mechanisms – Mechanisms :– Pantograph - Exact and approximate straight-line mechanisms.

Module II (13 hours)

Kinematics - Velocity and acceleration in mechanisms - graphical solution - Corioli's component of acceleration - Velocity analysis using instantaneous centers - Kennedy's theorem

Toothed gearing - Law of gearing - Cycloidal and involute profiles - gear terminology and standard proportions - length of arc of contact - path of contact and contact ratio - Interference and number of teeth to avoid interference - Gear trains - simple, compound, epicyclic and reverted gear trains - Gear ratio calculations.

Module III (13 hours)

Cams - classification of cams and followers - graphical determination of profiles for different followers and different types of motion.

Balancing – Static and dynamic balancing – balancing of several masses in a plane - balancing of masses rotating in several transverse planes- balancing machines.

Module IV (10 hours)

Vibration - kinematics of vibratory motion - vibration systems - vibration systems having single degree of freedom - un damped free vibration - forced vibration without damping - free vibration of system with several degrees of freedom - natural modes - coupled vibrations - transverse vibrations of shafts - Dunkerly's method - energy method - critical or whirling speeds - torsional vibrations.

Reference books

1. J.E.Shigley.kinematic analysis of mechanisms, Mcgraw hill
2. W.G. Green. Theory of machines., elbs
3. Den hartog. Mechanical vibrations, Mcgraw hill
4. I H Shames, Engineering mechanics, statics and dynamics, prentice hall of india.
5. Beer FP, & Johnston e r, vector mechanics for engineers – vol 2, Mcgraw hill
6. J.E. Shigley.dynamic analysis of machines , Mcgraw hill
7. Timoshenko and Young, Engineering Mechanics, ELBS.

Internal work assessment

60 % - Test papers (minimum 2)

30 % - Assignments/Term project/any other mode decided by the teacher. (At least one assignment should be computer based using spread sheet or suitable tools)

10 % - Other measures like Regularity and Participation in Class.

Total marks = 50

University examination pattern

Q i - 8 short type questions of 5 marks each, 2 from each module
Q ii - 2 questions of 15marks each from module i with choice to answer any one
Q iii - 2 questions of 15marks each from module ii with choice to answer any one
Q iv - 2 questions of 15marks each from module iii with choice to answer any one
Q v - 2 questions of 15marks each from module iv with choice to answer any one
(QII to V can have 2 subdivisions. At least 50% weightage for numerical problems.)

PE04 404 FLUID MECHANICS & MACHINERY

3 hours lecture and 1 hour tutorial per week

Objective

The objective of the subject is to equip the student with the basic principles, concepts, mathematical and analytical tools of Fluid Mechanics and also the construction, working principles and characteristics of different Hydraulic Machines so that he is able to analyse the real life situations.

Module I (13 hours)

Definitions and properties of fluids: – Density, gas laws, equations of state, viscosity, vapour pressure, compressibility, surface tension and capillarity etc.

Fluid pressure and its measurement: - intensity of pressure, Pascal's law, Variation of pressure in static fluid:- compressible and incompressible fluids, pressure head – manometers

Fluid statics: - hydrostatic forces on submerged surfaces, buoyancy and floatation, Archimedes principle, metacentre, stability of submerged and floating bodies.

Module II (13 hours)

Types of flow – stream line, path line, streak line-continuity equation- Bernoulli's theorem for the flow of incompressible fluids-

Flow through pipes – laminar and turbulent flow- critical Reynolds number- Hagen Poiseuille Law, development of boundary layer in pipes

Pipes in series- pipes in parallel-branch pipes-

Fluid flow measurements: - pitot tube, venturimeter, orifice meter, nozzle meter

Module III (13 hours)

Dimensional analysis - Physical dimensions - dimensional homogeneity - Buckingham's theorem - geometric, kinematic and dynamic similarities - theory of models

Pumps :- reciprocating pumps - principle of working, work done, effect of acceleration, frictional resistance, separation, air vessel etc.

Hydraulic devices - Hydraulic ram, accumulators, and intensifier - principles of working, gear pumps

Module IV (13 hours)

Impact of jets:- force exerted by fluid jet on (i) stationary curved vane (ii) moving curved vane.

Turbines - classification - reaction and impulse turbines - Pelton wheel, Francis, Kaplan, turbines etc. (simple problems)

Centrifugal pumps - work done by the impeller, - head, efficiency - specific speed - testing of pumps.

Reference Books

1.Daugherty and Franzini - Fluid mechanics with engineering applications, McGraw Hill
2.Massey - Mechanics of fluids, ELBS
3.Dr.Jagdish lal. - Hydraulic machinery, Metropolitan book Co.
4. Modi P.N., Seth S.M, Hydraulics and Fluid Mechanics, Standard Book House
5. Manohar M, Krishnamachar P, Fluid Mechanics Vol 1, Vikas Publishing House Pvt. Ltd.
6. Manohar M, Krishnamachar P, Fluid Mechanics Vol 2, Vikas Publishing House Pvt. Ltd.

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one
(QII to V can have 2 subdivisions. At least 50% weightage for numerical problems.)

PE04 405 THERMAL ENGINEERING

3 hours lecture and 1 hour tutorial per week

Objectives:
The objective of this subject is to aquaint the students with the fundamental concepts of Thermodynamics and Heat transfer. To equip the students to analyse and interpret various thermodynamic cycles and heat energy transfer systems.

Module I (12 HOURS)

Introduction concept of thermodynamic property and state – intensive and extensive properties – control volume approach – laws of thermodynamics – zero'th law and temperature – energy transfer as work – first law of thermodynamics and internal energy – reversibility and availability – entropy as a property – second law of thermodynamics – enthalpy – absolute entropy and third law of thermodynamics (problems of elementary nature)

Module II (14 hours)

Working substance and their properties – property charts and tables – representation of changes of state and process on T-S, H-S and P-h charts – characteristics of thermodynamic systems – ideal and practical cycles – air cycle – Carnot, Otto, Diesel and Brayton cycles – theoretical efficiencies – Rankine cycle and it's modifications – calculation of output and efficiencies – reversed heat engine cycle – refrigerating effect and COP (problems of elementary nature).

Module III (12 hours)

Compressors and refrigeration systems - air compressors - reciprocating and rotary compressors - principle of operation of compressors – refrigeration - vapor compression and absorption systems - principle of operation of refrigeration systems (problems of elementary nature)

Module IV (14 hours)

Conduction - Fourier heat conduction equation - thermal conductivity - one-dimensional heat conduction through planes - cylinders and spheres - extended surfaces – Convection - elementary ideas of free and forced convection – Radiation - principle of radiation heat transfer - Heat exchangers - parallel, counter and cross flow types (problems of elementary nature)

Text book

1. Kothandaraman.C.P. And Domkundwar s., Thermal engineering, Dhanpat Rai

Reference Books

1. YVC Rao , An Introduction to Thermodynamics, University Press(India) Pvt.Ltd.
2. YVC Rao , A Text Book of Heat Transfer, University Press(India) Pvt.Ltd.
3. P.K.Nag, Engineering Thermodynamics, Tata Mc Graw-Hill
4. S.K.Kulshrestha, Thermal Engineering, Vikas

Internal work assessment

60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any
(QII to V can have 2 subdivisions. At least 50% weightage for numerical problems.)

PE04 406 ELECTRONICS AND MICROPROCESSORS

3 hours lecture and 1 hour tutorial per week

Objectives:
To provide an exposure to the basics of electronics and Microprocessors which is useful to an engineer in an actual factory environment

Module I (14 hours)
Transistors - Bipolar junction transistor - CB, CE and CC configurations - Input and output characteristics in CE configuration - cut off, active and saturation regions - CE current gain - typical junction voltage values - Construction and V-I characteristics of JFET and MOSFET - Electronic circuits (qualitative study only) - operating point of BJT - load line and biasing circuits of CE amplifiers - RC coupled CE amplifier circuit and explanation - principle of cascaded amplifiers - rectifier circuits with capacitor filter -series and shunt voltage regulator circuits - principle of feedback amplifiers.

Module II (14 hours)
Linear integrating circuits - operational amplifiers - ideal characteristics - equivalent circuit - open loop operation of op. Amp - comparator - inverting and non inverting amplifiers - voltage follower circuits - Digital integrating circuits - Logic gates -AND, OR, NOT, NAND, NOR, EX-OR GATES - truth table and Boolean algebra - flip-flops-RS, JK and D flip flops - principle of shift registers and counters.

Module III (12 hours)
Introduction to microprocessor - block diagram of micro computer - CPU - architecture - of Intel 8085 - execution of instruction and timing consideration - memory organization - RAM, ROM, EPROM - floppy discs - I/O devices - CRT terminals - printers - key boards - I/O ports.

Module IV(12 hours)
Programming of microprocessors - instruction types - addressing modes - Intel 8085 instruction set - development of simple assembly language programs and examples - Microprocessor applications - microprocessor based frequency measurement - microprocessor based temperature control and speed control of motors - position controller (bock diagram approach only)

Referrences:-
1. Millman and Halbias - Integrated electronics,McGraw Hill
2. Albert Paul mahino and Donald .P .Leach. - Digital principles and applications, 4th edition,McGraw Hill

Internal work assessment
60 % - Test papers (minimum 2)
30 % - Assignments/Term project/any other mode decided by the teacher.
10 % - Other measures like Regularity and Participation in Class.
Total marks = 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one
(QII to V can have 2 subdivisions.)

PE04 407(P) MACHINE TOOL LAB- II

3 hours laboratory classes per week

Objectives:
The lab is designed to provide the Student with a thorough understanding of the machining processes and the machine tools. The student will have an on hand Experience in operating these machines and selection of parameters for a specific job.

Module I

Shaping, planing and slotting:- working principles of crank shapers - hydraulic shaper - speeds and feeds in shaping - planing operations - shaper and planer tools - types of planers and their relative merits - Differences between vertical shaper and slotter- description of slotting machines and types of work done.

Exercises - Shaping and planing, surfacing, T- slots, grooving, dove tail cutting and keyways in flat and cylindrical surfaces. Slotting : - Keyway cutting and grooving.

Module II

Milling:- types of milling machines - principles of milling - milling machine attachments - speeds and feeds in milling operations - grooves, splines, dove tail and cam milling, climb and conventional milling, string and gang milling.

Exercises - indexing head, simple and differential indexing, plain milling, cutting of spur and helical gears.

Module III

Grinding and Drilling: - Types of grinding machines, surfaces, cylindrical, universal, selection of grinding wheels, - tool and cutter grinders – live and dead centre grinding – taper grinding.

Drill geometry – drilling - boring and reaming – types of drilling machines

Exercises –demonstration of cylindrical and taper grinding operations and drilling operation.

[Note: - At least four models to be prepared]

Reference books:-

1. Hajra choudhary. – Workshop technology. (Vol. II),Media Promoters & Publishers
2. Chapman - Workshop technology (Vol. II and III), ELBS
3. Lindberg. –Manufacturing materials and processes, Prentice Hall of India
4. Begeman. – Manufacturing processes, Asia Pub.

Internal work assessment

Workshop Practicals & Record	= 25
Test	= 20
Regularity in Class	= 5
Total marks	= 50

PE04 408(P) ELECTRICAL AND ELECTRONICS LAB

3 hours laboratory classes per week

Objectives:
The lab provides an opportunity to understand the basic Electrical theories by conducting Experiments. This will also provide them with sufficient experience in designing Experiments to demonstrate or validate Electrical theory.

1. Study of starters (a) 3 point and 4 point starters for DC motors. (b) Star – delta, auto transformer and D.O.L. and rotor resistance starters for induction motors.
2. (a) Plot the open characteristics of the DC shunt generator at the rated speed. Pre- determination of OCC at some other speed and determination of critical resistance. (b) Perform load test on the given DC Shunt Generator and plot the external characteristics
3. Perform Break Test on DC Shunt and Series motors and plot the following characteristics
   a) Output v/s Efficiency. b) Output v/s Line current. c) Speed v/s Torque d) Line Current v/s Torque
4. a) Perform OC and SC test on single phase Transformer and pre-determine the following
   i) Equivalent Circuit , ii)Efficiency, iii) Regulation
   b) Perform load test on single-phase transformer and determine efficiency and regulation.
5. Perform Open circuit and short circuit tests on 3 phase alternator and pre-determine the regulation by emf and mmf methods.
6. Perform load test on 3 Phase cage induction motor and plot the following characteristics.
   a) Efficiency v/s Output. b) Slip v/s Output. C) Power factor v/s Output d) Torque v/s Output
7. Perform load test on 3 Phase slip-ring induction motor and plot following characteristics
   a) Efficiency v/s Output. b) Slip v/s Output. c) Power factor v/s Output d)Torque v/s Output
8. a) Familiarisation with electronic Components, Devices and Equipments. b) Study of CRO
9. Setup full-wave rectifier circuits with and with out capacitor filter using the given circuits. Observe the input and output wave forms on the CRO. Calculate the percentage regulation and plot V vs I curves.
10. Plot the static characteristics of BJT in CE configuration. Also draw load line on output characteristics and fix a most suitable operating point.
11. Using the given circuit setup an RC Coupled CE amplifier using BJT. Observe the input output wave forms on CRO. Also determine voltage gain and current gain.
12. Study the given 8085 microprocessor bit. Familiarise the steps for executing simple programs.
13. Write an assembly language program to add N numbers. Execute the program and verify the result.
14. Write a program to arrange a series in ascending and descending order. Execute the program and verify the result.
15. A) Study the SCR converter circuit B) Control the speed of the given DC Motor

Internal work assessment	
Practicals & Record	= 25
Test	= 20
Regularity in Class	= 5
Total marks	= 50