UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE
(2013 SCHEME)

SYLLABUS FOR
V SEMESTER
MECHANICAL ENGINEERING
### SCHEME -2013

#### V SEMESTER

**MECHANICAL ENGINEERING ( M )**

<table>
<thead>
<tr>
<th>Course No</th>
<th>Name of subject</th>
<th>Credits</th>
<th>Weekly load, hours</th>
<th>C A Marks</th>
<th>Exam Duration Hrs</th>
<th>U E Max Marks</th>
<th>Total Marks</th>
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<tbody>
<tr>
<td>13.501</td>
<td>Engineering Mathematics - IV (BCHMPSU)</td>
<td>4</td>
<td>3 1 D/P</td>
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<td>Theory of Machines (MP)</td>
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<td>3 1 D/P</td>
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<td>Industrial Electronics (MP)</td>
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<td>Mechanics of Materials (M)</td>
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<td>3 1 D/P</td>
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<td>3 1 D/P</td>
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<td>13.506</td>
<td>ELECTIVE I</td>
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**13.506 ELECTIVE I**

| 13.506.1  | Professional Ethics and Human Values (MPU)   |
| 13.506.2  | Advanced Welding Technology (MPU)            |
| 13.506.3  | Foundry Technology (MPU)                     |
| 13.506.4  | Advanced Fluid Mechanics (MPU)               |
| 13.506.5  | Composite Materials Technology (MPU)         |
| 13.506.6  | Non Destructive Testing (MPU)                |
| 13.506.7  | Powder Metallurgy (MPU)                      |
| 13.506.8  | Human Aspects of Management (MP)             |
| 13.506.9  | Environmental Science (MP)                   |
| 13.506.10 | Environmental Pollution Control (MP)         |
| 13.506.11 | Disaster Management (MP)                     |
13.501 ENGINEERING MATHEMATICS - IV (BCHMPSU)

Teaching Scheme: 3(L) - 1(T) - 0(P)       Credits: 4

Course Objective:

- To provide a basic understanding of random variables and probability distributions.
- Mathematical programming techniques are introduced as a part of this course. These techniques are concerned with the allotment of available resources so as to minimize cost or maximize profit subject to prescribed restrictions.

Module – I

Random Variables - Discrete and continuous random variables and their probability distributions-Probability distribution (density) functions - Distribution functions - mean and variance-simple problems-
Binomial distribution, Poisson distribution, Poisson approximation to Binomial, Uniform distribution, Exponential Distribution, Normal distribution - mean and variance of the above distributions(derivations except for normal distribution) - Computing probabilities using the above distributions.

Module – II


Module – III


Module – IV

Duality in LPP - Properties of primal and dual optimal solutions - solution using duality-
Transportation problem and Assignment problem.

References:


**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

**University Examination Pattern:**

Examination duration: 3 hours  
Maximum Total Marks: 100

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

*After successful completion of this course, the students will be familiar with the large scale applications of linear programming techniques which require only a few minutes on the computer. Also they will be familiar with the concepts of probability distributions which are essential in transportation engineering.*
13. 502 THEORY OF MACHINES (MP)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:

- To provide basic knowledge on kinematics of mechanisms and machines, synthesis of mechanisms, synthesis of cams, theory of gears and gear trains, belt rope drives and clutches.
- The knowledge of these topics are essential for students to develop their skills to solve practical design problems in the area of mechanisms and machines in the future courses.

Module – I


Straight line motion mechanisms – Watts mechanism, Paucellier mechanism, Hart mechanism - Automobile steering mechanisms- Davis and Ackermann steering mechanisms

Intermittent motion mechanism - Geneva mechanism.

Synthesis-Kinematic synthesis of planar mechanisms: Type synthesis, number synthesis, dimensional synthesis-Function generation and path generation-Precision points-Chebyshev’s spacing-two and three position synthesis of four bar and slider cranks mechanisms-Analytical method -Freudenstein’s equation.

Module – II

Kinematic analysis of planar mechanisms-Velocity and acceleration analysis –Instantaneous centre method - Aronhold Kennedy theorem-Locating I-centres (upto 6 link mechanisms) Velocity and acceleration diagrams using relative velocity method (Graphical approach only)- Coriolis component of acceleration-Velocity and acceleration analysis of slider crank mechanism.

Module – III

Cams: Classification of followers and cams- cam nomenclature -description of follower movement- construction of displacement diagrams: uniform velocity, simple harmonic motion, parabolic or uniform acceleration motion, cycloidal motion-synthesis of cam profile-graphical approach.

Gears: Classification-Helical, spiral, bevel and worm gears (description only).
**Spur gear:** terminology-law of gearing-gear tooth forms-path of contact-arc of contact-interference and under cutting – minimum number of teeth-gear standardization.

**Gear trains:** Types of gear trains - analysis of simple, compound, reverted and epicyclic gear train-torque in epicyclic gear train.

**Module – IV**

Applications of friction: Pivot and collar thrust bearings-uniform pressure and uniform wear theory-friction clutches-single and multi-plate clutches.

**Brakes:** Shoe Brake, Band brake.

**Belt drives:** types of belt drive-law of belting-slip and creep of belt-length of belt-ratio of belt tensions-centrifugal tension-condition for maximum power transmission-effect of initial tension on power transmission-V-belt-ratio of belt tensions, Rope drives (description only).

**References**


**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours*  
*Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.
Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course outcome:

- The students will understand the various aspects of mechanisms and machines.
- The students will have the basic knowledge to solve design problems in the area of mechanisms and machines.
Course Objectives:

- To learn industrial electronics in applied manner with perspective of mechanical engineering.
- To introduce the design philosophy for mechanical processes control based on analog and digital electronics

Module – I


Module – II

Industrial Applications of optoelectronic devices– smoke detection, level detection and counting of moving objects. Data acquisition system - block diagram and explanation of each block. Dielectric heating and Induction heating - principle and applications. Resistance welding and sequence timer. Measurement of pressure, displacement, level, flow, thickness, viscosity and PH.

Module – III

Micro controllers: Architecture of Intel 8051, pin functions, addressing modes. Instruction sets of 8051, Programming examples (addition, subtraction, 8 bit multiplication, 8 bit division, largest and smallest among an array of 8 bit numbers). Interface with seven segment LED, LCD and ADC. Temperature control using 8051 based system.

Module – IV


References:


**Internal Continuous Assessment** *(Maximum Marks-50)*

- 50% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as homework, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
- 20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours* 
*Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A** (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B** (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

*After the completion of the course, the students will be familiar with the use of electronic devices and systems in the field of mechanical engineering.*
13.504 MECHANICS OF MATERIALS (M)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objective:

- To impart concepts of stress and strain analysis in a solid.
- To study the methodologies in theory of elasticity at a basic level.
- To acquaint with energy methods to solve structural problems.

Module – I

Stress at a point – symmetry of stress components - normal and tangential components of stresses on an oblique plane - stress tensor - Cauchy’s equations - Stress transformation - principal stresses and planes - strain at a point - strain tensor - analogy between stress and strain tensors - strain-displacement relations. Compatibility conditions – Stress-strain relations for isotropic materials – Lame’s constants – Relationship between elastic constants.

Module – II

2-D problems in elasticity: Plane stress and plane strain problems – Airy’s stress function – solutions by polynomials – solutions of elastic problems for given polynomial functions  
Equations in polar coordinates - Axisymmetric problems – stresses in thick cylinders – Lame’s thick cylinder problem - interference fit – stresses in rotating discs.

Module – III

Energy methods in elasticity: Strain energy of deformation - special cases of a body subjected to concentrated loads, due to axial force, shear force, bending moment and torque – reciprocal relation -Maxwell reciprocal theorem - Castigliano’s first and second theorems - Principle of virtual work - minimum potential energy theorem - complementary energy.

Module – IV

Special problems in bending: Unsymmetrical bending – curved beams with circular and rectangular cross section – shear centre.

Torsion : Saint Venant’s theory - Prandtl’s method - solutions for circular and elliptical cross-sections - membrane analogy - torsion of thin walled open and closed sections- shear flow.

References:


**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.

20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours  Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

After successful completion of the course,

- The student should be able to understand how mathematical modelling of problems on stress analysis are formulated.
- To equip the student with an ability to use different methodologies in theory of elasticity at a basic level.
13.505 MACHINE TOOLS (MN)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:

- To impart the fundamental knowledge of mechanical machining processes that are now widely used in industries.
- To impart knowledge about various machine tools, machining processes, cutting tools, selection of these and the forces in these processes.
- To outline the widely used unconventional machining processes.

Module – I


Module – II


Shaper: Machine, Mechanism – Mechanical, hydraulic. Shaper operations – Cutting tools used – Calculation of cutting speed.

Module – III


Module – IV

Unconventional machining: Features of processes and machines – EDM, Wire cut EDM, ECM, LBM, USM, AJM, AWJM, EBM and Chemical Machining.
High energy rate forming: Concept, Processes – Explosive forming, Hydro forming, Electromagnetic forming.

Transfer machines: Concept, Mechanisms.

References:


Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After completing the studies of the content of this syllabus, students must be able to identify and select the machine, the machining process and the cutting tool when a particular product is to be manufactured
13. 506.1 PROFESSIONAL ETHICS AND HUMAN VALUES (MPU)

Teaching Scheme: 3(L) - 1(T) - 0(P) 
Credits: 4

**Course Objectives:**

- To facilitate the development of a holistic perspective among students towards life, profession and happiness, based on a correct understanding of human reality and the rest of existence.

**Module – I**


**Module – II**

**Engineering as social experimentation:** Engineering as experimentation - Engineering as responsible experimenters – Codes of ethics – A balanced outlook on law – The challenger case study.

**Safety, responsibilities and rights:** Safety and risk – Assessment of safety and risk – Risk benefit analysis and reducing risk – The Three Mile Island and Chernobyl case studies.

**Module – III**

**Harmony in the family and Society** – Understanding values in human-human relationship – foundational values of relationship, Trust and respect – Difference between intention and competence- Difference between respect and differentiation


**Module – IV**

**Global issues:** Multinational Corporation – Environmental ethics – Computer ethics Weapons development – Engineers as managers – Consulting engineers and engineers as expert witness and advisor – Moral leadership.
Sample code of ethics like ASME, ASCE, IEEE – Institution of engineers (India) – Indian Institute of Materials Management – Institution electronics and telecommunication engineering (IETE) India etc.

References

Internal Continuous Assessment (Maximum Marks-50)
50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:
Examination duration: 3 hours  Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course outcome:
- The students will be able to see that their practice in living is not in harmony with their natural acceptance most of the time, and all they need to do is to refer to their natural acceptance to remove this disharmony.
13. 506.2 ADVANCED WELDING TECHNOLOGY (MPU)

Teaching Scheme: 3(L) - 1(T) - 0(P)  Credits: 4

Course Objectives:
- To impart knowledge regarding various advanced welding practices in industries
- To understand the various parameters and requirements for welding processes.
- To know the comparative merits and demerits of various welding processes
- To understand the right kind of welding technique suitable for various joints.
- To learn about the joint designs adopted in different types of welding techniques

Module – I

Module – II

Module – III

Module – IV

References

6. Teo Goisky, *The electric welder*.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

*Examination duration: 3 hours Maximum Total Marks: 100*

*The question paper shall consist of 2 parts.*

**Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course outcome:

- Students are introduced to various advanced welding techniques which make them interested to choose a career in the field of welding.
- Students will understand the advanced welding practices in Industries and their comparative merits and demerits.
- Students will be able to choose the right kind of welding techniques for joining raw materials of various thicknesses.
- Students will be able to choose appropriate welding technique suitable for joining various types of metals.
13. 506.3 FOUNDRY TECHNOLOGY (MPU)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:

- To impart knowledge regarding various moulding techniques.

Module – I

Introduction to casting process and its potential, Chronology of the art of founding - Pattern making-pattern materials, Factor effecting the choice of pattern materials , pattern allowances, types of pattern, colour codes of pattern, pattern design.

Different types of moulding boxes – Green sand moulds, dry hand moulds, Loan moulds, plaster moulds, cement bonded moulds – bench moulding, floor moulding and pit moulding.

Module – II

Moulding sands : Natural sand , synthetic sand , sand mixing – General properties of moulding sand – Moulding materials-, moulding sand composition , Testing sand properties, ingredients and the properties of moulding sand, Sand preparation, sand conditioning and reclamation, Indian sands and other sands.

Cores and core making – Purpose of cores – core prints – Types of cores – Core sand and ingredients – Requirements of core sands – Core sand mixtures – Binding materials – Core boxes – Types of core boxes – Process of core making – Core baking , core creating , core reinforcing – core venting.

Module – III

Gating system design-Pouring time, choke area, sprue, other gating elements, Gating ratios, slag trap system.

Risering design-Caine’s method, modulus method, Naval research laboratory method, Feeding distances, chills, feeding aides.

Product design for sand casting-design for economical moulding, designing to eliminate defects, features to aid handling

Solidification of castings: mechanism of dendrite growth, solidification rate and time, Chvorinov’s rule.

Module – IV

Special casting process: Permanent mould casting, shell moulding, CO2 process, Expandable pattern casting (lost form). Precision investment casting, centrifugal casting, die casting, die casting alloys.
Melting and pouring: Types of furnaces used for cast irons, steels and non-ferrous metals – Composition, size and charge calculations – Mechanisation in foundry – Elementary ideas of machines used for sand conditioning, sand supply, moulding, core making, knock out and fettling.

References


**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours Maximum Total Marks: 100*

*The question paper shall consist of 2 parts.*
Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course outcome:

Students are introduced to various advanced moulding techniques and practices in Industries and their comparative merits and demerits.
13. 506.4 ADVANCED FLUID MECHANICS (MPU)

Teaching Scheme: 3(L) - 1(T) - 0(P) Credit: 4

Course Objectives:

- To provide the student with some specific knowledge regarding fluid-flow phenomena observed in mechanical engineering systems, such as potential flow, vortex flow, boundary-layer flows, etc.
- To undertake sustained learning in fluid mechanics to advance their knowledge of this field.
- To enhance the understanding of fluid mechanics, including the equations of motion in differential form and turbulence.

Module – I


Module – II


Module – III

Incompressible viscous flow. Concepts of laminar and turbulent flows. Stokes viscosity law. Navier Stoke’s equation and significance (Derivation not necessary). Simplification of Navier Stoke’s equation for steady incompressible flows with negligible body forces. Parallel flow
through straight channel and couette flow. Hagen - Poiseuille flow. Derivation of Hagen Poissuille equations for velocity and discharge through a pipe, derivation of friction factor for laminar flow, Couette flow for negative, zero and positive pressure gradients, flow in a rotating annulus, Viscometer based on rotating annulus.

**Module – IV**

Boundary layer theory, Boundary layer thickness, Displacement thickness, momentum thickness, Energy thickness and their calculation. Laminar Boundary Layers, Prandtl Boundary layer equations; Boundary layer on a flat plate, Blasius solution for flow over a flat plate, Von- Karman momentum integral equations, Pohlhausen approximation solution of boundary layer for non-zero pressure gradient flow, favorable and adverse pressure gradients, Entry flow into a duct, flow separation and vortex shedding.

Turbulent Flow: Introduction to turbulent flow, Governing equations of turbulent flow, Turbulent boundary layer equation, Flat plate turbulent boundary layer, Fully developed Turbulent pipe flow for moderate Reynold’s number, Prandtl mixing hypothesis, Turbulence modeling. Boundary layer control.

**References**


**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

**University Examination Pattern:**

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.
Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course outcome:

At the end of this course the students will be able to

- Recognize the particular flow regime that is present in a typical engineering system.
- Demonstrate the concept of stream function, potential function and boundary layer.
- Calculate the vorticity of a given velocity field and analyze the vorticity in idealized vortices: forced vortex and free vortex.
- Choose the appropriate fluid mechanics principles needed to analyze the fluid-flow situations.
- Recognize how fluid flow theory can be employed in a modern mechanical engineering design environment.
13. 506.5 COMPOSITE MATERIALS TECHNOLOGY (MPU)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:

To provide a sound understanding of

- composite materials used for engineering applications
- manufacturing methods and properties of MMCs, PMCs and CMCs
- micro mechanics of laminated composites.

Module – I

Composite Materials:- Definition, characteristics, Classifications based on structure reinforcement and matrices, Structural, functional and smart composites, Advantages and limitations, History, Industrial scene, Applications.


Matrix materials Wettability- - Interfacial bonding, Rule of mixtures.

Module – II

Introduction to orthotropic materials, generalized Hook’s Law, Lamina and laminate,
Introduction to micro-mechanics of laminated composites:-terminology and notation-nomenclature for defining stacking sequences –coordinate system.


Toughening mechanisms of composites, failure modes.

Module – III

Metal Matrix Composites (MMC): Metals. Inter-metallics and alloys used for MMC and their properties, Manufacturing methods of MMC: Stir Casting, Compocasting, powder metallurgy route, osprey method, in-situ - their properties-characteristics and applications.

Polymer matrix composites (PMC):- Thermo set, thermoplastic and elastomeric polymers, their properties, characteristics and utilisation as matrices, fiber performs.

Manufacturing methods:—autoclave/compression molding, filament winding, pultrusion, Properties and applications.
Module – IV

Ceramic Matrix Composites (CMC): Classification of ceramics and their potential role as matrices. Manufacturing methods: slurry and hot pressing, sol-gel processing and Lanxide process, properties and applications of CMC using fine ceramics and glass as matrices.

Post processing operations: Machining, cutting, polishing. Welding of thermoplastic PMC. Bonding and riveting. Advanced post processing methods like ultrasonic welding, waterjet cutting and laser machining.


References


Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours  Maximum Total Marks: 100
The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course outcome:

At the end of this course the students will be able to

- gain knowledge of commonly used matrix materials and reinforcements in composites.
- understand the manufacturing and post processing methods of composites.
- select suitable composite materials for applications based on property requirements.
- do micro mechanics based analysis of laminates.
13. 506.6 NON DESTRUCTIVE TESTING (MPU)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:

To provide a sound understanding of

- the basic principles of various non-destructive testing (NDT) methods.
- the importance applications and limitations of NDT.

Module – I


Module – II


Module – III

Ultrasonic testing of materials: Advantages, disadvantages, Applications. Generation of Ultrasonic waves, general characteristics of ultrasonic waves: methods and instruments for ultrasonic materials testing: special techniques.


Module – IV

Electrical methods: Eddy current methods: potential-drop methods, applications.


References


Internal Continuous Assessment (*Maximum Marks-50*)

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

*Examination duration: 3 hours*  
*Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course outcome:

At the end of this course the students will be able to

- Gain knowledge of the basic principles, techniques, applications and limitations of basic NDT methods.

- Use their knowledge in the selection of appropriate NDT methods.
13. 506.7 POWDER METALLURGY (MPU)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:

- To enable the student to understand the basic principles of Powder Metallurgy processes and the issues to be considered during design of parts
- To make the students to understand the various aspects of manufacturing of P/M components and the potential application.
- The objective of this course is to learn how to apply fundamental principles to the modern manufacturing processes.
- The course includes a detailed overview of science and technology of modern materials processing technique.

Module – I


Module – II

Powder blending techniques, additives used, Influence of additives on the material properties. Powder compaction: Mechanical, thermal and thermomechanical compacting processes. Presses used for transmission.


Module – III


Effect of compacting pressure, sintering temperature and time on sintered properties. Types of sintering furnaces. Sintering atmospheres. Secondary treatments. E.g. Sizing, coining, Machining, Heat treatment, Joining.

Module – IV

Manufacturing and application of important P/M components: Porous bearing, Electrical contact materials, Metallic filters, Cemented carbides, magnets, Friction materials and Composites.

References


Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course outcome:

- The student will be aware of the various ways of achieving the desired geometry of a part or component produced through powder metallurgy, with adequate defect control.
- The student will acquire an understanding of the method of developing a controlled microstructure to yield the desired properties and in-service performance of powder metallurgy products.
- The student will be able to optimize economic aspects of production of components using powder metallurgy, including the conservation of materials and energy.
13. 506.8 HUMAN ASPECTS OF MANAGEMENT (MP)

Teaching Scheme: 3(L) - 1(T) - 0(P)  

Credits: 4

Course Objectives:

- To teach how an organization acquires, rewards, motivates, uses, and generally manages its people effectively.
- To impart ability to manage human resources in a competitive world for survival is discussed. Use of innovative techniques to build up human relations is also dealt with.

Module – I


Module – II

Personality and leadership - concepts, theories and applications. Modes of values, beliefs, attitudes and intelligence in determining human behaviour. Group dynamics-nature of groups and group decision making. Interactive conflict and negotiation skills. Transactional Analysis. Case studies.

Module – III

Organizational development, Concepts of QWL-strategies for improved QWL, Organizational change, Resistance to change, Goals of organizational change and organizational development, Organizational culture- nature and characteristics, types, impact of culture in organizational behaviour, , Managerial leadership across cultures, Case studies.

Module – IV


References


**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours*  
*Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course outcome:**

At the end of this course the students will be able to:

- Understand fundamentals of management and different functions of it.
- Understand the various dimensions of human behavior to build up the personal relationship and to avoid personal conflict.
- Understand the need of the organizational change and organizational culture for the development of organizations.
- Understand the concepts of Human Resources Management to manage people in organizations to meet organizational objectives.
13. 506.9 ENVIRONMENTAL SCIENCE (MP)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:

The course is intended to provide a general insight in acquiring and applying scientific knowledge about environmental issues so as to understand the underlying scientific concepts and to develop a deeper understanding of environmental issues by relating scientific knowledge with other perspectives.

Module – I

Meaning, scope and interdisciplinary nature of Environmental Science, Environmental factors; The Global environment and its segments; Structure and composition of atmosphere, hydrosphere, lithosphere and biosphere.

Weather and climate: Weather Elements and their variations; Heat balance of the earth atmosphere system, Earth as a heat engine Major climatic zones of the world, Climates of India, Climate and vegetation, Climatic extremes – environmental implications, Global climate change and its impact on environment.

Module – II


Module – III


Hydrogen as an alternative future source of Energy.

Module – IV

Environmental Pollution and their effects. Water pollution, Land pollution. Noise pollution, Public Health aspects, Air Pollution, Solid waste management.

Acid Rain, Ozone Layer depletion, Animal Husbandry.

Environmental Protection- Role of Government, Legal aspects, Initiatives by Nongovernmental Organizations (NGO), Environmental Education, Women Education.

References


Internal Continuous Assessment *(Maximum Marks -50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours  Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course outcome:

At the end of this course the students will be able to understand the importance of protecting environment for future developments and also need for preserving natural resources for future generations.
13. 506.10 ENVIRONMENTAL POLLUTION CONTROL  (MP)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:

*The course is intended to provide a general insight in acquiring and applying scientific knowledge about environmental pollution caused by industries.*

Module – I

Environmental aspects - Impact of environment - Environmental quality – Role of environmental engineer. Air quantity - Definition, Characteristics and prospective - Types of our air pollutants - effect of air pollution on men and environment - Formation of air pollutants from combustion of fossil fuels and parameters controlling the formation.

Module – II

Water pollution from tanneries and other industries - Engineered systems for waste water treatment and disposal - Control systems and instrumentation for pollution control. Definition, characteristics - Types and sources of solid waste - Solid waste management - generation, collection, storage and processing techniques -Solid waste disposal.

Module – III

Methods and equipment's for industrial waste treatment - Pollution thermal power plants and nuclear power plants - Sources and control methods Control of air pollution by equipment, objectives of using control equipment, objectives of using control equipment, settling chambers, inertial separators, cyclones, Principle of electroscopic precipitators.

Module – IV


References


**Internal Continuous Assessment** *(Maximum Marks-50)*

- 50% - Tests *(minimum 2)*
- 30% - Assignments *(minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.*
- 20% - Regularity in the class

**University Examination Pattern:**

- *Examination duration: 3 hours  Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course outcome:**

At the end of this course the students will be able to understand the importance of protecting environment for future developments.
13. 506.11 DISASTER MANAGEMENT (MP)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:

The course is intended to provide a general insight in the dimensions of disasters caused by nature beyond the human control as well as the disasters and environmental hazards induced by human developmental activities.

Module – I


Module – II

Preparedness and mitigation measures for earthquakes, floods, tsunamis, landslides and volcanoes with special reference to construction of residential buildings and public utility buildings. Disaster mitigation planning of human settlements and townships for earthquakes, floods, tsunamis, landslides and volcanoes.

Module – III

Droughts: Droughts, causes, vulnerability, types, famines, deserts and desertification.

Biodiversity Extinction and Deforestation: Biodiversity, species at risks, loss of biodiversity, management of species diversity, deforestation its causes & adverse effects.

Green House Effects and Global Climate Changes: Green house gases, effects, global warming & its effects, ozone depletion, changes in carbon-dioxide; impact on ecosystem.

Mining: Mining and environment, land & environment degradation and management, mined land reclamation.

Module – IV

Issues in the prediction of natural disasters, land use practices and disaster mitigation. Integration of rural development programmes with natural disaster mitigation and planning. Information systems and decision making tools in disaster management. Disaster management in India.

References


**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

**University Examination Pattern:**

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course outcome:**

At the end of this course the students will be able to understand the various reasons for natural and man-made disasters and the need for proper management system at the time of such issues.
Course Objective:

- To acquaint the basics of lathe and accessories, shaping and slotting machine, planning machines.
- To learn the different tools used for various operations of machines.
- To impart training on plane turning, groove cutting, form turning, taper turning, facing and thread cutting.

List of Experiments:

1. General study of Lathe and Accessories, Tools used for different operations.
2. Exercises involving plane turning, Groove cutting, form turning, taper turning, facing and thread cutting.
3. Study of shaping and slotting machines, and planning machines, exercises involving production of flat surfaces, grooves and key ways.

Note: Students should do all the exercises mentioned above.

Internal Continuous Assessment (Maximum Marks - 50)

40% - Test
40% - Class work and Record
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours Maximum Total Marks: 100
Questions based on the list of experiments prescribed.
80% - Procedure, calculations if any, working/machining, accuracy.
20% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

At the end of the course, the students will be familiar with the various operations using lathe, shaping, slotting and planning machines.
13.508 ELECTRICAL AND ELECTRONICS LAB (MPU)

Teaching Scheme: 0(L) - 0(T) - 3(P)  
Credits: 3

Course Objective:

- To give a practical knowledge on the working of electrical machines including dc machines, transformers, induction motors and synchronous motors. It also gives the basics about design and implementation of small electronic circuits.

List of Experiments:

1. OCC on a dc shunt generator, determination of critical resistance, critical speed, additional resistance required in the field circuit
2. Load characteristics of DC Shunt generator
3. Load characteristics of DC Compound generator
4. Load test on DC Series motor
5. Load test on DC Shunt motor
6. Load test on single phase transformer
7. Starting of three phase squirrel cage induction motor by star delta switch, load test on three phase squirrel cage induction motor
8. Load test on three phase slip ring induction motor
9. Load test on single phase induction motor.
10. OC and SC test on single phase transformer
11. V-I Characteristics of diodes and Zener diodes
12. Input and output characteristics of CE configuration of BJT S. Determination of $\beta$, input resistance and output resistance.
13. Half wave and full wave rectifiers with and without filters- Observe the waveforms on CRO.

Internal Continuous Assessment (Maximum Marks - 50)

- 40% - Test
- 40% - Class work and Record
- 20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours  
Maximum Total Marks: 100

Questions based on the list of experiments prescribed.

- 75% - Theory, Procedure, Circuit and design (30%);
Conducting experiment, Observation, Tabulation (30%)

Results and inference (15%)

25% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

At the end of this course the students will be able to test and validate DC generators, DC motors and Transformers. Students will have the basic knowledge on working of semiconductor devices.