UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE
(2013 SCHEME)

SYLLABUS FOR
VII SEMESTER
MECHANICAL - STREAM - PRODUCTION ENGINEERING
# SCHEME -2013
## VII SEMESTER
### MECHANICAL - STREAM - PRODUCTION ENGINEERING

<table>
<thead>
<tr>
<th>Course No</th>
<th>Name of subject</th>
<th>Credits</th>
<th>Weekly load, hours</th>
<th>CA Marks</th>
<th>Exam Duration Hrs</th>
<th>U E Max Marks</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.701</td>
<td>Principles of Management and Decision Modeling (MPU)</td>
<td>3</td>
<td>2 1 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>13.702</td>
<td>Mechatronics (MPSU)</td>
<td>4</td>
<td>3 1 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>13.703</td>
<td>Computer Integrated Manufacturing System (P)</td>
<td>4</td>
<td>3 1 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>13.704</td>
<td>Theory of Metal Cutting (P)</td>
<td>4</td>
<td>3 1 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>13.705</td>
<td>Machine Tool Design (P)</td>
<td>4</td>
<td>3 1 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>13.706</td>
<td>Elective III</td>
<td>4</td>
<td>3 1 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>13.707</td>
<td>Production Tooling Lab (P)</td>
<td>2</td>
<td>- - 2</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>13.708</td>
<td>CIM Lab (P)</td>
<td>2</td>
<td>- - 2</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>13.709</td>
<td>Project and Project Seminar (MNPSU)</td>
<td>2</td>
<td>- - 2</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>29</td>
<td>17 6 6 500</td>
<td>800</td>
<td>1300</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 13.706 Elective III

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.706.1</td>
<td>Plant Engineering &amp; Maintenance (MPU)</td>
</tr>
<tr>
<td>13.706.2</td>
<td>Fracture Mechanics (MPU)</td>
</tr>
<tr>
<td>13.706.3</td>
<td>Entrepreneurship Development (MPU)</td>
</tr>
<tr>
<td>13.706.4</td>
<td>Finite Element Methods (MPU)</td>
</tr>
<tr>
<td>13.706.5</td>
<td>Metal Forming (MPU)</td>
</tr>
<tr>
<td>13.706.6</td>
<td>Non-Conventional Machining Techniques (MPU)</td>
</tr>
<tr>
<td>13.706.7</td>
<td>Experimental Methods In Engineering (MPU)</td>
</tr>
<tr>
<td>13.706.8</td>
<td>Mechanical Vibration &amp; Noise Control (MPU)</td>
</tr>
<tr>
<td>13.706.9</td>
<td>Failure Analysis (MPU)</td>
</tr>
<tr>
<td>13.706.10</td>
<td>Industrial Automation (MPU)</td>
</tr>
<tr>
<td>13.706.11</td>
<td>Advanced Thermodynamics (MP)</td>
</tr>
<tr>
<td>13.706.12</td>
<td>Industrial Heat Transfer (MP)</td>
</tr>
<tr>
<td>13.706.13</td>
<td>Computer Graphics (MP)</td>
</tr>
<tr>
<td>13.706.14</td>
<td>Marketing Management (MP)</td>
</tr>
<tr>
<td>13.706.15</td>
<td>Industrial Hydraulics (MP)</td>
</tr>
<tr>
<td>13.706.16</td>
<td>Machine Tool Technology (MP)</td>
</tr>
<tr>
<td>13.706.17</td>
<td>Turbo Machines (MP)</td>
</tr>
<tr>
<td>13.706.18</td>
<td>Bio Materials (MP)</td>
</tr>
<tr>
<td>13.706.19</td>
<td>Concurrent Engineering (MP)</td>
</tr>
<tr>
<td>13.706.20</td>
<td>Alternate Energy Sources (MP)</td>
</tr>
</tbody>
</table>
13.701 PRINCIPLES OF MANAGEMENT AND DECISION MODELING (MPU)

Teaching Scheme: 2(L) - 1(T) - 0(P)  
Credits: 3

Course Objective:

The main objectives of this course are

- To understand evolution of scientific management and principles of management in organizations.
- To understand different types of industrial ownerships and organizational structures.
- To learn the methods and techniques to effectively manage human resource in an organization.
- To understand various quantitative techniques in decision making.

Module – I

Evolution of Scientific management: Principles and functions of scientific management, Levels and skills of management.

Organizational structure: Authority, responsibility and span of control - system concept of management - Line and staff, project and matrix organization.

Formation of companies: Proprietary Partnership and joint stock companies – private limited, public limited companies, cooperative organizations and Government organizations.

Module – II

Selection of site- factors to be considered – Economic vs. social significance of location.

Plant layout- different types- process, product, fixed position and group technology layout.

Personnel management - objectives and function-recruitment, selection, orientation and training of workers Industrial safety and health - Labour welfare – Industrial psychology.

Module – III


Decision making-Types of decisions-The decision making process - decision tree - linear programming and its application in management, transportation and assignment problems.

Module – IV

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:**

At the end of the course the students will be able to have an understanding of various tools and techniques for the efficient and effective use of resources in an organization and application of these techniques for better management of the organization.
13.702 MECHATRONICS (MPSU)

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

Course Objectives:

The main objectives of this course are

- To understand the features of various sensors used in CNC machines and robots.
- To study the fabrication and functioning of MEMS pressure and inertial sensors.
- To develop hydraulic/pneumatic circuit and PLC program for simple applications.

Module – I


Module – II


Module – III


System modeling - Mathematical models and basic building blocks of general mechanical, electrical, fluid and thermal systems.

Module – IV

finders. Robotic vision system - Image acquisition: Vidicon, charge coupled device (CCD) and charge injection device (CID) cameras. Image processing techniques: histogram processing: sliding, stretching, equalization and thresholding.

Case studies of Mechatronics systems: Automatic camera, bar code reader, pick and place robot, automatic car park barrier system, automobile engine management system.

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 the course students will be able:

- To discuss mechanical systems used in mechatronics
- To integrate mechanical, electronics, control and computer engineering in the design of mechatronics systems.
13.703 COMPUTER INTEGRATED MANUFACTURING SYSTEMS (P)

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

Course Objectives:

This course provides in-depth coverage of various topics in the subject Computer Integrated Manufacturing. It contains description of integration of computer with design and manufacturing. It also covers topics such as Data Communication systems for CIM, Group Technology, Computer Aided Process Planning and Flexible manufacturing systems. In addition to this, students can acquire knowledge in the field of material handling system, automated guided vehicles and Robotics.

Module – I

Product development cycle - Application of computer for design (CAD), manufacturing (CAM) and integration of CAD/CAM - Elements of Computer Integrated Manufacturing (CIM) Systems – Product design to marketing. Various activities in CIM – From product design to marketing, Sequential and concurrent engineering, Expert system – Concepts and features. Data base technology - basic concepts, requirements, Types - Data base management - DBMS - RDBMS.

Module – II


Module – III


Module – IV

Introduction to CAM – Numerical Control (NC), CNC, DNC system – Definition, types, basic components and principle of operation. Accuracy and repeatability. Features of CNC systems
- Absolute and incremental, preparatory and miscellaneous codes, interpolation and canned cycle, tool compensation. Simple turning and drilling programs only.

CNC machine – structural details - configuration and design - guideways - friction, antifriction and other types of guideways, elements to convert rotary motion to linear motion - screw and nut, recirculating ball screw, planetary roller screw, rack and pinion, torque transmission elements - gears, timing belts, flexible couplings, bearings.

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:

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

- Identify the various elements of CNC, GT, FMS and CIM
- Develop part family by identification and coding system
- Demonstrate the modern tools like CMM, RP, Robots and CAI
- Develop simple part programmes for turning and milling
13.704 THEORY OF METAL CUTTING (P)

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

Course Objective:

- To familiarize the student with tool nomenclature and cutting forces in different cutting conditions.
- To impart knowledge on tool materials, tool life and tool wear.
- To give knowledge about thermal aspects of machining and heat distribution while machining.
- To educate students on failure analysis of cutting tools and to use effectively.

Module – I

Introduction to metal cutting and metal removal processes, classification of cutting tools, geometry of single point and multi point cutting tools, tool nomenclature- ASA and ORS systems-inter relationship. Effect of tool geometry in metal cutting. Mechanism of metal removal-Primary deformation on shear zone and Secondary deformation on rake face- Chip formation, types of chip, BUE formation- Friction in metal cutting-methods to reduce friction chip breaker. Basics of milling and drilling tool.

Module – II

Orthogonal and Oblique cutting- Mechanics of orthogonal cutting-Forces of deformation-shear angle, its importance- Stress distribution on rake face- Determination of shear angle and chip thickness ratio-Force relations- Merchants circle diagram-Influence of speed, feed and depth of cut in cutting-related simple problems. Shear plane theory, Lee and Shaffer principle.

Module – III


Module – IV

Cutting tool materials-Desirable properties of tool materials-major tool materials- Carbon steels, HSS, Coated tools, Cemented carbide, Ceramics, CBN, and Diamond- their characteristics and applications. Tool wear and tool life- Wear mechanisms, types, tool failure, crater wear, flank wear-Tool life criteria-Taylors tool life equation, modified tool life
equation, parameters affecting tool life-problems. Cutting fluids- Types and applications- minimum quantity lubrication.

References:

1. Sen and Bhattacharya, Principle of Metal Cutting.
2. Shaw M. C., Metal Cutting Principles.
5. HMT, Production Technology.
6. Trent E.M., Metal cutting.
7. ASTME, Tool Manufacturing Engineers Hand Book.
8. P.C. Sharma, Production Engineering.

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.

Note: Use of approved charts and tables are permitted in the examination hall.

Course Outcome:

After successful completion of the course, the student will be able to:

- Analyze cutting forces in turning, drilling and milling.
- Adjust varies parameters and reduce temperature developed during machining.
- Reduce the cost of machinery.
- Prevent failures of cutting tool.
Course Objectives:

- To develop an ability to design a component, process or a system to meet desired applications within the realistic constraints.
- To develop the ability to identify, formulate, and solve engineering problems applying the knowledge of mathematics, science, and engineering.
- To develop the ability to use the techniques, skills, and modern engineering tools including relevant software necessary for engineering applications.

Module – I


Module – II


Module – III

Introduction to Stepped and Stepless Drives: Stepped Regulation of Speed, Laws of Stepped Regulation, Standard progression ratio- AP, GP, HP & LP, Relation between Range ratio, Geometric Progression Ratio and No. of Speed Steps, Step less Regulation of Speed & Feed Rates.

Design of Stepped Drives: Break up of Speed Steps, Structural Formulae, Structural Diagram, Selection of Best Structural Diagram, Ray Diagram, Speed Chart, General recommendations for Developing the Gearing Diagram, structure & ray diagrams for machine tool speed gear boxes and its design.

Design of chain drives: roller chains, geometric relationships, power rating and design.

Module – IV

Design of machine tool structure-functions of machine tool structure and their requirements-materials. Basic design procedure in machine tool structures – Role of Static & Dynamic Stiffness in the design of elements of machine tools -profiles of machine tool structures-design of beds & columns, bases & tables. Design of guide ways-functions and types-design of slide ways-design criteria and calculations for slide ways-design of anti-

**Design Data hand book**


**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.

*Note: Use of approved data book is permitted in the examination hall.*

**Course Outcome:**

After successful completion of the course, the student will be able to:

- Identify, understand, and quantify failure modes for mechanical parts.
- Demonstrate knowledge on basic machine elements used in machine design.
- Take decisions successfully while approaching a design problem when there is not a unique answer.
- Proficiently use of relevant engineering skills, tools or even software for analysis and design.
Course Objectives:

The main objectives of this course are

- To gain knowledge in plant engineering and maintenance.
- To become familiar with maintenance management.
- To study the different maintenance management schemes.

Module – I

Wear – fundamentals and analysis – Classification – Theories of wear – Wear – fundamentals
Testing of lubricants selection of lubricants-lubricating mechanisms.

Module – II


Module – III


Module – IV

Safety engineering, accident prevention programme, safety design concepts, fire protection- industrial noise - Legislations on safety in industry. Recent Developments in maintenance methods – RCM - CBM – DMS – TPM 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:

At the end of the course students will be able:

- To discuss wear and theories of failure.
- To suggest maintenance schemes.
- To discuss safety issues and related rules.
13.706.2 FRACTURE MECHANICS (MPU) (Elective III)

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

Course Objectives:

The main objectives of this course are

- To get knowledge in fracture phenomena in metals and non-metals.
- To become familiar with testing methods.

Module – I


Module – II


Module – III


Module – IV

Sustained load fracture: Time-to-failure (TTF) tests - crack growth rate testing - experimental problems - method of predicting failure of a structural component - practical significance of
sustained load fracture testing Practical problems: Through cracks emanating from holes - corner cracks at holes - cracks approaching holes - fracture toughness of weldments - service failure analysis - applications in pressure vessels - pipelines and stiffened sheet structures.

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 the course students will be able

- To predict material failure for any combination of applied stresses.
- To estimate failure conditions of a structure.
- To predict the likelihood of failure of a structure containing a defect.
13.706.3 ENTREPRENEURSHIP DEVELOPMENT (MPU) (Elective III)

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

Course Objectives:

The main objectives of this course are

- To gain knowledge entrepreneurship process.
- To become familiar industrial policies.
- To know process strategies for starting a venture.

Module – I

Entrepreneurial perspectives - understanding of entrepreneurship process - entrepreneurial decision process - entrepreneurship and economic development - characteristics of entrepreneur - entrepreneurial competencies- managerial functions for enterprise.

Module – II


Module – III

Process and strategies for starting a venture - stages of small business growth, Entrepreneurship in international environment - achievement motivation – time management - creativity and innovation structure of the enterprise - planning, implementation and growth.

Module – IV

Technology acquisition for small units - formalities to be completed for setting up a small scale unit - forms of organizations for small scale units – financing of project and working capital - venture capital and other equity assistance available - break even analysis and economic ratios technology transfer and business incubation.

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 the course students will be able*

- To discuss the strategies for starting an a venture.
- To discuss industrial policies.
13.706.4 FINITE ELEMENT METHODS (MPU) (Elective III)

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

Course Objectives:
The main objectives of this course are

- To understand the fundamental concepts of the theory of the finite element method.
- To solve simple structural and heat transfer problems using finite element methods.

Module – I

Module – II

Module – III

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 the course students will be able

- To identify mathematical models for solution of common engineering problems.
- To formulate simple problems into finite elements.
- To solve simple structural and heat transfer problems using finite element method.
13.706.5 METAL FORMING (MPU) (Elective III)

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

Course Objectives:

The main objectives of this course are

- To gain deeper knowledge on metal forming under different conditions and in various processes.
- To do analyses of rolling and forging processes.

Module – I


Module – II

Plastic potential theory - plastic work - maximum work hypothesis – stability postulates - isotropic and kinematic hardening - plastic flow - temperature and strain rate effects in plastic flow Processes - drawing and extrusion - process classification - lubrication - temperature effects - analysis of the processes of drawing and extrusion of wire and strip through friction less dies and dies with friction - production of seamless pipe and tubes - analysis - residual stresses in rods - wires - tubes, deep drawing.

Module – III

Classification of rolling processes - hot rolling - cold rolling - rolling of bars and shapes - analysis of rolling process in conditions of plane stain. Classification of forging process - open die forging - closed die forging - analysis of forging process in conditions of plane stain - forging allowances and tolerances - sheet metal forming, shearing, blanking, bending and stretch forming.

Module – IV

Slip line field theory - incompressible two-dimensional flow - slip lines - equilibrium equations referred to slip lines - Henkeys theorem - hodographs - simple slip line field analysis in extrusion - compression of block between parallel plates - strip load on semi-infinite body - lower and upper bound theorems with proofs and 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:**

<table>
<thead>
<tr>
<th>Examination duration: 3 hours</th>
<th>Maximum Total Marks: 100</th>
</tr>
</thead>
</table>

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 identify suitable process for a particular application.
- To discuss various processes such as rolling, forging etc. and also the theories
13.706.6 NON-CONVENTIONAL MACHINING TECHNIQUES (MPU)
(Elective III)

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

Course Objectives:

The main objective of this course is to introduce the various non traditional machining techniques.

Module – I


Module – II


Module – III

Ultrasonic Machining Process-working principles-types of transducers concentrators- nodal point clamping-feed mechanism-metal removal rate- Process parameters. Applications.

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 identify suitable process for a particular application.
- To discuss the various non traditional machining techniques.
13.706.7 EXPERIMENTAL METHODS IN ENGINEERING (MPU) (Elective III)

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

Course Objectives:  
*The main objective of this course is to introduce the various measuring instruments.*

Module – I


Module – II


Module – III


Module – IV


References

3. Donald P. Eckman, Industrial Instrumentation, John Wiley.

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 the course students will be able

- To identify the suitable instrument for measuring transport parameters
- To detect suitable range of pressure gauge and compute
- To distinguish different flow visualization methods and temperature measurements.
- To determine thermal conductivity in solids, liquids and gases and radiation measurements.
13.706.8 MECHANICAL VIBRATION & NOISE CONTROL (MPU) (Elective III)

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

Course Objectives:

The main objectives of this course are

- To apply the laws of motion to oscillating systems
- To examine the effects of energy-removal mechanisms; i.e. damping.
- To introduce modes of vibration in terms of system physical parameters.
- To introduce types of noise and noise control.

Module – I


Module – II


Module – III

Introduction to sound and vibratic wave motion – One dimensional plane waves – Characteristics impedance – Decibel sits power, density and intensity – Sound transmission through one and two intervening media. Measurement of Sound – Loud speakers and microphones – Their characteristics, Band pass filters, graphic level recorder, Narrow Band Analysers - Measurement in reverberation and Vachaic chamber – Hearing mechanism of hearing and perception of sound (Description only).

Module – IV

Auditorium – Acoustical requirements – Elimination of room acoustical defects – Articulation index – Sound reinforce systems – Design of time delays (Brief 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:

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

- To appreciate the need and importance of vibration analyses in mechanical systems.
- To analyze the mathematical model of vibratory systems.
- To discuss source of noise and types of noise.
13.706.9 FAILURE ANALYSIS (MPU) (Elective III)

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

Course Objectives:

The main objectives of this course are

- To get knowledge in failure investigation and analysis.
- To introduce experimental stress analysis.
- To get knowledge in fracture mechanics.

Module – I

Introduction: Objectives of failure investigation, Collection of background data service history, photographic records, Selection of samples for various conditions, Preliminary examination of the failed part – visual inspection and non destructive techniques for failure investigation- Magnetic particle inspection, Liquid penetrant inspection, Eddy current inspection, ultrasonic inspection, radiography, acoustic emission inspection.

Module – II

Experimental stress Analysis Mechanical testing, limitations of tensile testing, Selection preservation and cleaning of fracture surfaces- cleaning, sectioning, opening secondary cracks Macroscopic examination of fracture surfaces, Microscopic examination of fracture surfaces – optical microscopy, scanning electron microscopy, transmission electron microscopy, Selection and preparation of metallographic sections, Examination and analysis of metallographic sections.

Module – III

Determination of fracture type- Failure mechanisms and Fractography of ductile fracture, brittle fracture, transgranular brittle fracture, Intergranular brittle fracture Fatigue fracture- Mechanisms and general features of fatigue fracture Stress corrosion cracking, Liquid metal embrittlement, Hydrogen embrittlement, Creep and stress rupture failures, ductile to brittle fracture transition Chemical analysis- Analysis of bulk materials, analysis of surfaces and deposits, spot tests.

Module – IV

Applications of fracture mechanics: Fracture mechanics concepts- Linear elastic fracture mechanics, Elastic-Plastic fracture mechanics (basic concepts), plane stress and plane strain, Fatigue crack growth rate their use in failure analysis, fracture toughness testing- Plane strain fracture toughness test, COD test, Simulated service testing, Analyzing the evidences
formulating conclusions and report writing, Case studies of failures: failures of shafts, failures of heat exchangers.

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 investigate failure using various techniques.
• To discuss the various tools/equipment used for investigations of failure.
• To discuss the various types of fracture and also application of fracture mechanics.
13.706.10 INDUSTRIAL AUTOMATION (MPU) (Elective III)

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

Course Objectives:

The main objectives of this course are

- *To introduce the automation and types of automation*
- *To gain knowledge in pneumatics*
- *To introduce robotics and automatic assembly process.*

Module – I

Introduction: Basic concept of Automation, Types of Automation, Feasibility etc. Industrial Hydraulics: Introduction, basic concepts, Hydraulic fluids, Classification and properties of hydraulic fluids, Contaminates in hydraulic system, control and cleanliness standards, Fluid power generators, i.e. Gear, Vane, Piston pumps, linear and Rotary Actuators, Direction Control Valves, types, actuation methods, pressure control valves; pressure reducing valves, pressure relief valve, Unloading valve, Sequence valve, Counterbalance valve, Flow control valves simple and pressure compensated type.

Module – II

Pneumatics: Introduction, Basic components, Source, storage and distribution, treatment of compressed air, linear and Rotary actuators, Direction control valves – types, actuation methods, pressure control valves, logic devices – twin pressure valve, shutter valve, time delay valve, Pneumatic circuit design and analysis, conventional as well as computer aided design.

Module – III

Robotics: Basic concepts, classification based on Geometry, programming, drives, work volume of robots world and joint coordinates various joints, DOF, end effectors – Types and uses, Sensors in Robots, programming – Teach pendant and Computer programming, Introduction to forward and inverse kinematics, Applications of Robots.

Module – IV

References


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

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as homework, 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 the course students will be able

- To discuss automation and various components used
- To discuss robotics and applications of robots
- To implement automatic assembly system.
13.706.11 ADVANCED THERMODYNAMICS (MP) (Elective III)

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

Course Objectives:
The main objectives of this course are

- To introduce thermodynamics of reactive mixtures and chemical equilibrium.
- To gain knowledge in statistical thermodynamics.

Module – I
Review of the fundamentals of classical thermodynamics – Multi phase and multi component systems – Free energy functions – Applications of free energy functions to phase changes – Clausius – Clapeyron equations – Binary systems containing liquid and solid phases. Thermodynamics of reactive mixtures – Bond energy, heat of formation, heat of reaction – Adiabatic flame temperature entropy changes for reacting mixtures.

Module – II

Module – III

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 the course students will be able

- To apply the knowledge of thermo chemistry in combustion problems.
- To use the knowledge in statistical thermodynamics and quantum mechanics.
- To apply statistical thermodynamics to calculate properties such as viscosity, specific heat etc.
13.706.12  INDUSTRIAL HEAT TRANSFER (MP)  (Elective III)

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

Course Objectives:
The main objectives of this course are
- To enhance the knowledge in heat transfer.
- To apply the knowledge about heat transfer in equipment used in industries.

Module – I
One-dimensional steady state heat conduction with uniform internal heat generation. Plane wall with heat sources, cylinder with heat sources. Transient and periodic conduction (One-dimensional). Lumped heat capacity system. Simple analytical methods. Use of Heisler charts. Principles of Convection – Viscous flow, different hydrodynamic boundary layer flow regimes and flat plates – Laminar boundary layer on a flat plate – Momentum equation of the laminar boundary layer with constant properties – Internal Momentum analysis of laminar boundary layer.

Module – II

Module – III

Module – IV
The basic processes of condensation – Liquid formation, nucleation of drops at solid surfaces, droplet growth – Film condensation on a vertical flat plate - Nusselt equation for a laminar film – Improvements to the original Nusselt theory – The influence of turbulence – Condensation of horizontal tubes – Condensation within a vertical tube - Drop wise
condensation. Elementary concepts of Heat transfer in magneto fluid dynamic (Transpiration cooling, low density heat transfer and ablation) (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:**

At the end of the course students will be able

- *To discuss the heat transfer processes in industrial heat transfer equipment.*
- *To do thermal design of heat transfer equipment.*


13.706.13 COMPUTER GRAPHICS (MP) (Elective III)

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

Course Objectives:

The main objectives of this course are

- To introduce algorithms used to generate simple objects and transformations.
- To introduce Mathematical formulation on Surface description and generation.

Module – I


Module – II

Transformation: Simple problems on 3D transformations and applications, Viewing transformations, Windowing, Clipping, Cohen-Sutherland outcode algorithm, Sutherland-Hodgman Algorithm, Clipping of polygons.

Module – III


Module – IV

Mathematical formulation on Surface description and generation- Surface of revolution – Sweep surfaces, quadric surfaces, Solid modeling techniques etc. Hidden line and hidden surfaces, Z-Buffer algorithm, Scan Line algorithm for curved surfaces.

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 the course students will be able

- To write algorithms for creation of simple primitives and transformations.
- To carry out formulation on surface description and generation.
13.706.14 MARKETING MANAGEMENT (MP) (Elective III)

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

Course Objectives:

The main objectives of this course are

- To introduce the concept of market and marketing.
- To give idea about launching a new product.
- To introduce the various marketing strategies.

Module – I

Introduction to marketing - concept of market and marketing – marketing environment - controllable factors - factors directed by top management - factors directed by marketing - uncontrollable factors - demography, economic conditions, competition, social and Marketing planning - marketing planning process - Boston consultancy group model - marketing mix - marketing mix variables.

Module – II

Developing, testing and launching of new products .Market segmentation and market targeting - introduction to segmentation - targeting and product positioning. Marketing research - need and scope - marketing research process – research objectives, developing research plan, collecting information, analysis, and findings - consumer behaviour - factors influencing consumer behaviour -perceived risks.

Module – III

Product life cycle - marketing strategies for different stages of product life cycle, Marketing communication - marketing mix variables - steps in developing effective communication - identification of target audience - determination of communication objectives.

Module – IV

Designing the message - selecting the communication channels - promotion mix evaluation - advertising and sales promotion - factors in advertising - sales promotion tools. New trends in marketing- Brand management - significance of branding to consumers and firms.

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 the course students will be able

- To state the role and functions of marketing within a range of organizations.
- To describe key marketing concepts, theories and techniques for analyzing a variety of marketing situations.
- To identify and demonstrate the dynamic nature of the environment in which marketing decisions are taken
- To synthesize ideas into a marketing plan.
Course Objectives:
The main objectives of this course are

- To introduce various fluid power systems.
- To get knowledge on fluid power circuits.

Module – I

Module – II

Module – III

Module – IV
Simple reciprocating, Regenerative, Speed control (Meter in, Meter out and bleed off), Sequencing, Synchronization, transverse and feed, circuit for riveting machine, automatic reciprocating, fail safe circuit, counter balance circuit, actuator locking, circuit for hydraulic press, unloading circuit (Numerical treatment), motor breaking circuit.

References
1. Pippenger J. J. and Tyler Gregory Hicks, Industrial Hydraulics, McGraw Hill.
8. ISO - 1219, *Fluid Systems and components, Graphic Symbols*

**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 the course students will be able

- *To discuss the various components used in fluid power systems.*
- *To select the suitable system for a particular application.*
- *To discuss the various fluid circuits used in hydraulic systems.*
13.706.16 MACHINE TOOL TECHNOLOGY (MP) (Elective III)

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

Course Objectives:

The main objectives of this course are

- To gain knowledge in accuracy, surface finish and tolerance.
- To study various drives used in machine tools.
- To study erection and testing of machine tools.

Module – I

Principal requirements and specifications – Requirements regarding quality of performance (Accuracy and surface finish) – Productivity (Role of material renewal) – Economy and efficiency of machine tools. Design aspects – Kinematic principles in machine tools with respect to the basic elements and their design – tool, column, frame, slides, guide ways, shafts, spindles, bearings, clutches, rigidity of machine tools structures – Sources, effects and elimination of vibration.

Module – II

Machine tools drives and their kinematics – Electrical, Mechanical, Hydraulic and combination systems - Design of a stepped gear box. Hydraulic power, Transmission systems used in machine tools and their various elements – A few common hydraulic circuits used to effect movement of tools slide and work tables.

Module – III


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 the course students will be able

- To discuss the efficiency of machine tools in terms of accuracy and surface finish.
- To discuss the various types of drives used in machine tools.
- To suggest design for improved performance of machine tools.
13.706.17 TURBOMACHINES (MP) (Elective III)

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

Course Objectives:
The main objectives of this course are

- To enable the students know the operation of turbomachines.
- To provide students thorough understanding of velocity triangles, turbo-machinery
- To introduce students to fans, turbines, pumps etc.

Module – I
Energy transfer between fluid and rotor, classification of fluid machinery, dimensionless parameters, specific speed, applications, stage velocity triangles, work and efficiency for compressors and turbines.

Module – II
Centrifugal fans and blowers: Types, stage and design parameters, flow analysis in impeller blades, volute and diffusers, losses, characteristics curves and selection, fan drives and fan noise.

Centrifugal Compressors: Construction details, types, impeller flow losses, slip factor, diffuser analysis, losses and performance curves.

Module – III
Axial flow compressors: Stage velocity triangles, enthalpy-entropy diagrams, stage losses and efficiency, work done factor, simple stage design problems and performance characteristics.

Module – IV
Axial and radial flow turbines: Stage velocity diagrams, reaction stages, losses and coefficients blade design principles, testing and performance characteristics.

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 the course students will be able

- To solve problems on turbo-machines
- Demonstrate the knowledge of working, stages, performance characteristics, governing and selection of turbo-machinery.
13.706.18 BIO MATERIALS (MP) (Elective III)

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

Course Objectives:

The main objectives of this course are

- To gain knowledge in metallic, ceramic and composite biomaterials.
- To introduce biomaterial characterization.

Module – I


Module – II

Ceramic and composite biomaterials: Introduction, Bio inert Bio Ceramics, Biodegradable ceramics, Bioactive ceramics, deterioration of ceramics, manufacturing techniques, Biocompatibility and Application of Composite Biomaterials.

Module – III


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 the course students will be able

- To identify the biomaterial for a particular application.
- To discuss manufacturing processes of biomaterials.
- To discuss biomaterial characterization and selection methods.
13.706.19 CONCURRENT ENGINEERING (MP) (Elective III)

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

Course Objectives:

The main objectives of this course are

- To introduce concurrent design methodologies, artificial intelligence and manufacturing competiveness.
- To provide knowledge on life cycle realization.

Module – I

Extensive definition of Concurrent Engineering (CE) - CE design methodologies - Organizing for CE - CE tool box collaborative product development. IT support - Solid modeling - Product data management - Collaborative product commerce.

Module – II

Artificial Intelligence- Expert systems - Software hardware co-design. Life-cycle design of products - opportunity for manufacturing enterprises - modality of Concurrent Engineering Design - Automated analysis idealization control - Concurrent engineering in optimal structural design - Real time constraints.

Module – III

Manufacturing competitiveness - Checking the design process - conceptual design mechanism - Qualitative physical approach - An intelligent design for manufacturing system. JIT system - low inventory - modular -Modeling and reasoning for computer based assembly planning – Design of Automated manufacturing.

Module – IV


References


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

- **50% - Tests** *(minimum 2)*
- **30% - Assignments** *(minimum 2)* such as homework, 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 the course students will be able

- To use artificial intelligence in concurrent engineering
- To discuss the process of manufacturing competitiveness and life cycle realization.
13.706.20 ALTERNATE ENERGY SOURCES (MP) (Elective III)

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

Course Objectives:

The main objectives of this course are

- To provide students an overview of global energy resources.
- To introduce students to bio-fuels, hydrogen energy and solar energy.
- To expose students to future energy systems and energy use scenarios with a focus on promoting the use of renewable energy resources and technologies.

Module – I

Introduction: Need for non-conventional energy sources, energy conservation in transportation sector, alternative energy, alcohol, hydrogen, biomass, and electric energy Alcohol: Methanol and Ethanol production methods, properties of methanol and ethanol as engine fuels, use of alcohols in SI engines. Performance of methanol and gasoline blends. Combustion characteristics of alcohols in S.1 engines, use of alcohols in CI engines, different methods of use- Alcohol Diesel emulsions, dual fuel systems, Flex fuel Vehicles (FFV).

Module – II


Module – III

Gaseous fuels: Biogas production, description of biogas plant, application of biogas as a single fuel and dual fuel, performance of LPG, property & its use in SI engines, fuel metering system, natural gas and producer gas - use in S.I. and C.1 engines. Vegetable oil: Vegetable oil properties, Production of Bio-diesel, esterification of vegetable oil, Soya bean diesel, rapeseed oil, rice bran oil etc., diesel and vegetable oil blends, and engine performance with vegetable oil.

Module – IV

Solar power: Collection and storage of solar energy, collection devices, flat plate collectors, concentrating type collectors, principle and working photovoltaic conversion, application to automobiles, Electric vehicles: Design considerations, limitations, batteries for electric
vehicles, types & capacities, driving requirements, applicability of electric cars, comparative use of fuel and energy recharging, Hybrid vehicles - types and layouts.

References

3. Keeith Owen and Trevor Colley, Automotive Fuels Reference Book, SAE.
4. Tom Koppel, Powering the Future, SAE.
6. Bob Brant, Build Your Own Electric Vehicle, SAE.
7. SAE papers: 73802, 750121, 750118, 741008.
10. Mathur and Sharma, IC. Engines, Dhanpat Rai and Sons.

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 the course students will be able

- To discuss global energy resources.
- To discuss the renewable technologies like solar, biomass, wind, hydrogen etc. to produce energy.
- To involve in optimizing and selecting an alternate source of energy.
13.707 PRODUCTION TOOLING LAB (P)

Teaching Scheme: 0(L) - 0(T) - 2(P)  
Credits: 2

Course Objective:
To provide exercise on milling and grinding machine and tool force measurement.

List of Experiments:
1. Milling machine: Exercise on milling spur gear and helical gear.
3. Tool grinding – Exercise on Single point cutting tool grinding.
4. Force measurement: Exercise on force measurement using
   a) Lathe tool dynamometer
   b) Drilling tool dynamometer.
   c) Milling tool dynamometer
5. Exercise on temperature measurement in metal cutting.

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 exercises prescribed.
80% - Procedure, calculations if any, working, results.
20% - Viva voce

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

Course Outcome:

At the end of the course, students shall be able to:

- Select suitable machining operations according to engineering needs.
- Calculate various parameters related to Gear cutting/Tool Grinding.
- Measure cutting forces/Temperature during machining.
- Work effectively as an individual and a team leader
- Communicate to society by documenting observations, calculations and results.
13.708 CIM LAB (P)

Teaching Scheme: 0(L) - 0(T) - 2(P)  
Credits: 2

Course Objective:

*To provide knowledge of CNC machines and its application in manufacturing.*

List of Experiments:

1. Manual part programming for CNC machines using standard G codes and M codes
2. Study and exercise on CNC Milling Machine for
   - a. Profile milling
   - b. Surface milling
   - c. Drilling and Reaming
   - d. Pocket milling
3. Study and exercise on CNC Lathe for
   - a. Plane turning
   - b. Taper turning
   - c. Thread cutting
   - d. Form turning

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, accuracy/result.
- 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 able to:

- Develop and implement part programme on CNC Machines for various operations
- Use CAM software for NC code generation
- Use Coordinate Measuring Machine (CMM) for Measurement of Flat, Cylindrical and Spherical surfaces
- Make simple components using Rapid prototyping (RP) Machine.
13.709 PROJECT AND PROJECT SEMINAR (MNPSU)

Teaching Scheme: 0(L) - 0(T) - 2(P)  
Credits: 2

Course Objective:

- To identify a problem for the final-year project, outline a solution, and prepare a preliminary design for the solution.
- To do a detailed study on the selected topic based on current journals or published papers and present seminars
- To improve the ability to perform as an individual as well as a team member in completing a project work.
- The seminar based on the project provides students adequate exposure to presentations to improve their communication skills.

The student shall do a project (project phase 1) in the seventh semester, which shall be continued in the eighth semester. He/she shall submit an interim report at the end of the seventh semester and the final project report shall be submitted at the end of the eighth semester. The student shall present two seminars in the seventh semester on the work carried out during project phase 1. The first seminar should highlight the definition of problem, novelty of the project, literature survey and work plan/methodology. The second seminar should include preliminary results. The students may be assessed individually/ and in groups.

**Internal Continuous Assessment** *(Maximum Marks-100)*

- 40% - Assessment by the Guide
- 40% - Assessment by the Committee.
- 20% - Regularity in the class

Course Outcome:

At the end of the course, the students would have acquired the basic skills to perform literature survey and paper presentation. This course shall provide students better communication skills and improve their leadership quality as well as the ability to work in groups, and thus aid them in building a successful career as an engineer.