UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE
(2013 SCHEME)

SYLLABUS FOR
VI SEMESTER
MECHANICAL - STREAM - PRODUCTION ENGINEERING
# SCHEME -2013
## VI 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>C A Marks</th>
<th>Exam Duration Hrs</th>
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<td>13.601</td>
<td>Metrology &amp; Instrumentation (MP)</td>
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<td>13.604</td>
<td>Production Process-II (P)</td>
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<td>13.605</td>
<td>Machine Theory and Design (P)</td>
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<td>13.606</td>
<td>ELECTIVE II</td>
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<tr>
<td>13.607</td>
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<td>13.608</td>
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### 13.606 ELECTIVE II

<table>
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<tr>
<th>Course No</th>
<th>Name of subject</th>
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<td>Artificial Intelligence Systems (MPU)</td>
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<td>Mechanical Working Methods (MPU)</td>
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<td>13.606.10</td>
<td>Object Oriented Programming (MP)</td>
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<td>13.606.12</td>
<td>Instrumentation and Control (MP)</td>
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<td>13.606.13</td>
<td>Precision Engineering (MP)</td>
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Course Objective:
The main objectives of this course are
- To understand the basic principles of measurements.
- To learn the various linear and angular measuring equipments, their principle of operation and applications.
- To learn about various methods of measuring Mechanical parameters.

Module – I
General principles of measurement: Precision, accuracy and the influencing factors.
Angular measurements: Bevel protractor, spirit level, clino-meter, angle gauges, sine bar, Sine centre.

Module – II

Module – III

Module – IV
Co-ordinate measuring machine – Types, features, measurement process.
Transducers: Classification - Static and Dynamic characteristics.


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 successful completion of this course, the students will be able,

- To know about quality control and quality assurances.
- To design sensors and transducers used for measurements.
- To understand the importance of quality in engineering products.
Course Objectives:

This course aims to equip the students with fundamental knowledge of dynamics of machines so that they can appreciate problems of force analysis, balancing of systems & vibrations.

Module – I


Module – II


Module – III


Module – IV

Types of vibrations – Basic elements of a vibrating system - Undamped force vibrations, different methods of analysis, Free vibrations with viscous damping, logarithmic decrement, forced vibrations, vibration isolation and transmissibility. Force due to unbalance - Force due to support motion – Vibration measuring instruments - vibrometers – accelerometers.


Torsional vibrations Free torsional vibrations – Single rotor - Two rotor, three rotor systems – Torsionally equivalent shaft - geared systems.
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:

After successful completion of this course, the students will be able,

- To develop sufficient background in the application of knowledge in force analysis of mechanisms
- To understand the fundamentals of free and forced response of single degree of freedom vibration.
- To understand the dynamic balancing of revolving and reciprocating masses. Understand the fundamentals of gyroscopes and its applications and governors.
13.603 COMPUTER AIDED DESIGN (MPU)

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

Course Objectives:

To equip students with fundamentals of computer aided design and to provide elementary algorithms in computer graphics and finite element analysis for basic engineering problems.

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, 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:**

Students successfully completing this course are expected to have basic knowledge in computer aided design, capability to prepare fundamental graphics algorithms and solve basic structural problems using finite element method.
13.604 PRODUCTION PROCESSES II (P)

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

Course Objective:

- To understand the role of production processes like rolling, forming, forging, press working etc in manufacturing of different mechanical parts.
- To understand the principles of various advanced welding processes and their application.
- Familiarization of inspection method and equipments.

Module – I


HERF –Explosive forming, Hydro forming, Electromagnetic forming.

Principle and applications of metal spinning and stretch forming processes.

Module – II

Theory of Metal Forming: Introduction to cold/hot forming processes: Metallurgical aspects of metal forming - effects of temperature, strain rate, microstructure and friction in metal forming, yield criteria and their significance, classification of metal forming processes


Module – III

Module – IV


Special Welding Processes: Soldering, brazing and their applications

Design of Weldment: Welding symbols-Positions of welding-joint and groove design-weld stress-calculations-design of weld size, estimation of weld dilution, heat input, effect of welding parameters preheating, and post heating temperature: Selection of electrodes, flux etc.

Testing of welded joints: Destructive testing of weldments – Strength, hardness and ductility, Non destructive testing of weldments - ultrasonic dye penetrant, magnetic particle inspection, X ray testing procedures. Residual stresses and stress relieving techniques, Welding symbols, Defects in welding : causes and remedies.

References:

2. Welding Engineering Handbook - ASME
3. Rossi, Welding Engineering
5. Serope Kalpakjian and Steven R Schmid, Manufacturing Engineering and Technology, Pearson Education.
7. ASM Metals Hand Book

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:

- The students will acquire a fundamental knowledge on metal forming technology, able to identify the process characteristics, select the main operator parameters, the tool geometry and materials.

- The students will acquire the capability to design welded joints and selection of welding methods, able to identify the welding defects.
13.605 MACHINE THEORY AND DESIGN (P)

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

Course Objectives:

- To provide a firm foundation to the mechanics of deformable solids.
- To provide basic knowledge on the design considerations and methodology of various machine elements.
- To develop an ability to design a system, component, or process to meet desired needs within realistic constraints.
- To develop an ability to identify, formulate, and solve engineering problems.
- To develop an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Module – I

Module – II

Module – III
Shafts design- stresses in shafts- causes of failure in shafts - design based on strength and rigidity- design based on strength and rigidity, design for static and fatigue loads- repeated loading- reversed bending and steady torsion-design of couplings- rigid and flexible couplings-design of keys and pins; Threaded joints – thread standards- thread nomenclature – stresses in screw threads- bolted joints, preloading of bolts.

Module – IV
Springs- classification, stresses and deflection of helical springs with axial loading – curvature effect – resilience - static and fatigue loading- surging- stress analysis and design of leaf springs- nipping.
Pressure vessels, thin cylinders, Thick cylinder equation, open and closed cylinders.

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

- Be able to analyze the stress and strain on mechanical components; and understand, identify and quantify failure modes for mechanical parts. Enable the student to analyse and solve a variety of strength-related design problems encountered in practice.
- Demonstrate knowledge on basic machine elements used in machine design; design machine elements to withstand the loads and deformations for a given application, while considering additional specifications.
- Be able to approach a design problem successfully, taking decisions when there is not a unique answer.
- Identify the functional characteristics of some machine element. Design or select from standard tables and catalogues machine elements, components and materials given appropriate performance requirements.
13.606.1 ARTIFICIAL INTELLIGENCE SYSTEMS (MPU) (Elective II)

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

Course Objectives:

The main objectives of this course are

- To understand the importance of artificial intelligence in the current scenario
- To provide brief idea about various languages, logical ideas in LISP and streams
- To implement the technology of AIS in planning and production systems

Module – I

Definition - history and applications - propositional calculus – predicate calculus - inference rules - structures and strategies for state space search - heuristic search algorithms - heuristics in games - complexity issues – control and implementation of state space search - production systems - planning - the blackboard architecture.

Module – II


Module – III

Languages - issues - network representation – conceptual graphs - structured representation Languages and programming techniques for AI - overview of LISP - search - higher order functions and procedural abstractions - search strategies - pattern matching - recursion - interpreters.

Module – IV

Logic programming in LISP - streams and delayed evaluation - expert system shell in LISP – network representations and inheritance – CLOS Introduction to understanding natural language - introduction to automated reasoning - introduction to machine learning.

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 know about the uses and applications of AIS.
- To understand the issues and solutions about AI languages.
- To understand the fuzzy sets, reasoning techniques and pattern matching.
Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:

The main objectives of this course are

- To impart an idea about various mechanical working methods, their design, uses and problems encountered
- To create a skill in selecting appropriate working methods as per design requirement.
- To identify the relative advantages, disadvantages in selecting a machining process.

Module – I


Module – II

Materials for mechanical working - A brief survey of the characteristics and composition of the common ferrous and nonferrous alloys and nonmetallic materials used for mechanical working.
Rolling Metals – Fundamental principles of metal rolling classification of rolled products, types and sizes –Basic principles of draughting schedule design and roll pass design (simple examples ) Roll load and power required in rolling – Problems encountered and defects in rolling practice.

Module – III

Forging, Extrusion and Wire drawing – Principles of product design and die design in forging – Calculation of forging loads and selection of hammers and process for forging – Design of extrusion and wire – drawing dies –Computation of power requirements problems encountered and defects in the above processes.

Module – IV

Press working of metals – Description and classification of the processes –Product and die design for shearing, blanking drawing and bending –Compound and progressive dies – Computation of capacities and tonnage requirements forblanking, piercing and drawing operations – Process selection and selection of process problems and defects in press working.
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 understand the features of different mechanical working methods
- To get sufficient knowledge in hot and cold working, rolling, forging, extrusion and wire drawing and press working
- To design and develop elements of mechanical processing systems.
13.606.3 SYSTEM MODELING & SIMULATION (MPU) (Elective II)

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

Course Objectives:
The main objectives of this course are

- To introduce different system modelling and simulation techniques.
- To illustrate about analytical models, random number generations, validation of models and simulation software.
- To provide a brief idea about simulation languages, alternative modelling and simulators.

Module – I

System concepts - components of a system - discrete and continuous systems - types of system study - system analysis - system design and system postulation - system modelling - types of models - system simulation - steps in a simulation study - comparison of simulation and analytical models - Monte Carlo simulation – examples of simulation of single server, single queue systems and simple inventory systems - concepts in discrete event system simulation - event scheduling/time advance algorithm - modeling world views.

Module – II


Module – III


Module – IV

Simulation modelling and analysis of manufacturing systems - objectives - performance measures - issues in simulation of manufacturing systems – simulation of simple job shop manufacturing systems - Introduction to simulation software for manufacturing applications - salient features of simulation languages such as general purpose simulation system (GPSS)
and simulation language for alternative modeling (SLAM) - salient features of simulators such as WITNESS and ARENA.

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 understand the principles, uses and applications of modeling and simulations.
• To get an overall idea about GPSS, SLAM, WITNESS and ARENA.
• To develop simulation software for manufacturing applications.
13.606.4 MATERIALS HANDLING (MPU) (Elective II)

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

Course Objectives:
The main objectives of this course are

- To aware about the significance of material handling in production industry
- To learn the basics of material handling techniques and how they can be effectively and efficiently used to support facility objectives.
- To understand the underlying mechanisms to design, and develop material handling devices.

Module – I
Importance of Materials Handling- Principles of Materials Handling – Principal groups of Materials handling equipment – General characteristics and applications of materials handling equipment – Modern trends in Materials handling.


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 effectively design and analyze material handling devices.
- To describe the safe work practices utilizing various types of hoisting and conveying equipment.
- To identify industry regulations necessary for material handling operations.
13.606.5 TOTAL QUALITY MANAGEMENT (MPU) (Elective II)

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

Course Objectives:

The main objectives of this course are

- To introduce the main principles of business and social excellence, to generate knowledge and skills of students to use models and quality management methodology for the implementation of total quality management in various business organizations.
- To introduce about TQM principles, customer orientation and management tools.
- To provide an idea about quality standards.

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 this course the students will be able:

- To know the principles of total quality management and peculiarities of their implementation.
- To be able to use quality management methods analyzing and solving problems of organization.
- To know business excellence models and be able to assess organization’s performance making reference to their criteria.
13.606.6 ADVANCED MANUFACTURING PROCESSES (MPU) (Elective II)

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

**Course Objectives:**

The main objectives of this course are

- To provide an idea about the advanced machining theory and practice techniques used in industry.
- To develop an ability to look for the unconventional manufacturing process to machine the objects
- To understand appreciate the latest manufacturing process in fabrication.

**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 this course the students will be able:

- To learn the art of manufacturing new products due to the development of new materials and process.
- To select suitable process while fabricating new machine parts.
- To get information in SCREAM, SIMPLE, LIGA process.
13.606.7 MATERIAL CHARACTERISATION (MPU) (Elective II)

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

Course Objectives:

The main objectives of this course are

- To provide basic descriptions of a range of common characterization methods for the determination of the structure and composition of solids.
- To introduce the scope of optical metallographic studies.
- To understand the major components of material characterization essential to the understanding of the physical properties of solids.

Module – I

Scope of metallographic studies in materials science. Understanding image formation, resolution of a microscope, numerical aperture, magnification, depth of field and depth of focus. Important lens defects and their correction, principles of phase contrast. Bright field and dark field contrast, sample preparation. Optical microscopy, interference and polarized light microscopy, quantitative analysis using optical microscopy (inclusion analysis, grain size determination volume fraction of phases etc.).

Module – II

Production and properties of X-rays, X-ray diffraction, Bragg’s law of diffraction, Scattering of an electron by an atom, by a unit cell, structure factor and intensity calculations. Stereographic projection, Effect of texture, particle size, micro and macro strain on diffraction lines. Indexing of powder photographs. Chemical analysis by X-rays, Stress measurement, Particle size determination.

Module – III

Construction and working principles of transmission electron microscopes. Image formation, resolving power, magnification, depth of focus, elementary treatment of image contrast. Bright field and dark field images, sample preparation techniques. Selected area diffraction, reciprocal lattice and Ewald sphere construction, indexing of selected area diffraction patterns.

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 understand microstructure investigations using optical microscopes.
- To explain construction of working principles of electron microscopes.
- To gain knowledge on different types of analyses using XRD.
13.606.8 MICROMACHINING METHODS (MPU) (Elective II)

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

Course Objectives:

The main objectives of this course are

- To get an overview of various techniques used for machining in the micro scale.
- To understand the theory of micromachining.
- To give an introduction about various applications of MEMS.

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 this course the students will be able:

- To gain knowledge on the structure of materials in the micro scale.
- To explain various micro machining processes and to differentiate its uses.
- To do micro machining tool design.
13.606.9 NEW ENERGY SYSTEMS (MP) (Elective II)

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

Course Objectives:
The main objectives of this course are

- To provide an overview of various energy sources and its applications.
- To aware about the need of newer energy sources to meet the extending demands.
- To understand the theories and principles behind various energy systems.

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 this course the students will be able:

- To explain the use of newer energy sources and their applications.
- To design and develop various bio-gas plants.
- To understand the various practical fuel cells.
13.606.10 OBJECT ORIENTED PROGRAMMING (MP) (Elective II)

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

Course Objectives:

The main objectives of this course are

- To develop an understanding of the principles underpinning object oriented programming.
- To apply object-based approaches for programming.
- To understand the essential features of an object oriented programming language.

Module – I

OOPS and Java basics - Java virtual machine - Java platform API – extended security model - applet classes - exceptions and abstract classes – Java applet writing basics - GUI building with canvas - applet security – creating window applications - writing console applications - utility and math packages.

Module – II

Swing programming - working with swing components - using the clipboard - input/output streams - printing - working with 2D and 3D Graphics – using audio and video - creating animations Java beans development kit - developing beans - notable beans.

Module – III

Network programming - client and server Programs - naming and directory services - working with Java management APIs Distributed application architecture - CORBA - RMI and distributed applications.

Module – IV

Working with remote objects - object serialization and Java spaces - Java IDL and ORBs, connecting to database - using JDBC - integrating database - support into web applications - Java servlets - JSDK - JAR files - Java native interface.

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 produce class diagrams, object interaction diagrams and object state transition diagrams for a given problem.
- To produce and/or debug code fragments that illustrate principles of object oriented software development.
- To evaluate the quality of programs according to object oriented principles.
**13.606.11 NUCLEAR ENGINEERING (MP) (Elective II)**

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

**Course Objectives:**

The main objectives of this course are:

- To explore the engineering design of nuclear power plants using the basic principles of reactor physics, thermodynamics, fluid flow and heat transfer.
- To provide an overview on reactor principles, nuclear safety, and reactor dynamic behaviour.
- To explain the standards of radiation protection and need for nuclear waste disposal.

**Module – I**


**Module – II**


**Module – III**


**Module – IV**

Reactor heat removal / equations of heat transfer as applied to reactor cooling – Reactor heat transfer systems – Heat removed in fast reactors.


**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 understand the theories and principles behind the nuclear engineering.*
- *To understand the heat removal techniques applied to reactor heat transfer systems.*
- *To acquire knowledge about nuclear physics, nuclear reactor, nuclear fuels, reactors and safe disposal of nuclear wastes.*
13.606.12 INSTRUMENTATION AND CONTROL (MP) (Elective II)

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

Course Objectives:

The main objectives of this course are

- To provide an overview of different types of measurement systems.
- To introduce various measuring devices for temperature, pressure and flow and the transducers used.
- To explain the need, design techniques and importance of control systems.

Module – I


Module – II


Module – III


Module – IV

Control system- Classification of control system- Block diagram- Rule of Block diagram algebra- Transfer functions, Set point- Identification of plat, Characteristics- First order proportional and second order proportional elements- Dynamic response – Analogues circuits stability of control systems- Routh – Hurwitz criterion- Nyquist criterion.
References

4. Pribanco A.E., Industrial Instrumentation.

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 understand the functions of instrumentations and its various types.
- To select suitable measuring devices depending upon the nature of measurement.
- To draw the control system block diagrams and able to check the stability of the control systems.
13.606.13 PRECISION ENGINEERING (MP) (Elective II)

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

Course Objectives:

The main objectives of this course are

- To provide an overview of micro manufacturing process and lithography.
- To introduce principles applied to precision engineering systems, including: accuracy, errors, spindle accuracy and advanced CNC systems.
- To introduce various micro systems.

Module – I


Module – II


Module – III


Module – IV


References

1. Murthy R.L. Precision Engineering in Manufacturing, New Age International, 2005

**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 understand the accuracy-errors in NC systems.
- To use and understand the various micro manufacturing process.
- To know the different and micro systems and their applications.
13.607 COMPUTER AIDED MODELING AND ANALYSIS LAB. (MPU)

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

**Course Objective:**
- To train the students in Solid Modeling and Assembly of machine parts.
- To practice finite element approach in the design of engineering systems.

**PART: A – MODELLING & ASSEMBLY**

Introduction to various modeling and assembly tools in CAD software. Exercise on the creation of solid models. Exercise on the creation of assembled models of riveted joints, cotter joints, shaft couplings and machine parts

**PART: B - FINITE ELEMENT ANALYSIS**

Introduction to pre-processing and post processing tools in finite element software. Exercise on the application of Finite Element Method to Engineering systems:-
- (1) Structural Analysis
- (2) Thermal Analysis

**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.
The question paper shall consist of 2 parts.
- **PART- I:** 50 Marks from Part-A
- **PART -II:** 30 Marks from Part-B

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 understand various phases in engineering design process through modeling, assembly and finite element analysis.
13.608 METALLURGY AND METROLOGY LAB (P)

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

Course Objective:

To exercise microstructure, measurement of grain size, roughness etc and various measuring instruments.

List of Exercises:

1. Microstructure study: Specimen preparation, microstructure study of Steels, Cast iron and Brass.
2. Grain size measurement.
3. Heat treatment study – Effect on Mechanical properties and microstructure of Steels, Cast iron, Brass and Aluminium.
4. Linear measurements using Vernier callipers and external and internal Micrometers, height gauge and depth gauges.
5. Angular measurements using Bevel protractors, angle gauges, sine bar
6. Slip gauges
7. Exercise on comparators: mechanical, pneumatic and electronic comparators
8. Flatness testing of surface plates using auto collimators.
9. Measurement of surface roughness using roughness measuring machines
10. Measurements using Profile projector.

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.
Scheme shall be given at the time of examination.
Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

At the end of the course, the students shall be familiar with various measuring techniques and will be able to study micro structures.