

**Syllabus for
T. E. (Mechanical Engineering)
(2015 Course)**

Course Name : Design of Machine Elements – I**Course Objective:**

1. Student shall gain appreciation and understanding of the design function in Mechanical Engineering, different steps involved in designing and the relation of design activity with manufacturing activity.
2. The student shall learn to choose proper materials for different machine elements depending on their physical and mechanical properties. They will learn to apply the knowledge of material science in real life situations.
3. Student shall gain a thorough understanding of the different types of failure modes and criteria. They will be conversant with various failure theories and be able to judge which criterion is to be applied for a particular situation.
4. Student shall gain design knowledge of the different types of elements used in the machine design process, for e.g. fasteners, shafts, couplings etc. and will be able to design these elements

Course Outcome:

1. Ability to identify and understand failure modes for mechanical elements and design of machine elements based on strength.
2. Ability to design Shafts, Keys and Coupling for industrial applications.
3. Ability to design machine elements subjected to fluctuating loads.
4. Ability to design Power Screws for various applications.
5. Ability to design fasteners and welded joints subjected to different loading conditions.
6. Ability to design various Springs for strength and stiffness.

Course Code: 302042 Course Name : HEAT TRANSFER

Course Objectives:

1. Identify the important modes of heat transfer and their applications.
2. Formulate and apply the general three dimensional heat conduction equations.
3. Analyze the thermal systems with internal heat generation and lumped heat capacitance.
4. Understand the mechanism of convective heat transfer
5. Determine the radiative heat transfer between surfaces.
6. Describe the various two phase heat transfer phenomenon. Execute the effectiveness and rating of heat exchangers.

Course Outcomes:

- CO 1: Analyze the various modes of heat transfer and implement the basic heat conduction equations for steady one dimensional thermal system.
- CO 2: Implement the general heat conduction equation to thermal systems with and without internal heat generation and transient heat conduction.
- CO 3: Analyze the heat transfer rate in natural and forced convection and evaluate through experimentation investigation.
- CO 4: Interpret heat transfer by radiation between objects with simple geometries.
- CO 5: Analyze the heat transfer equipment and investigate the performance.

Course Code: 302043 Course Name : Theory of Machine – II

Course Objectives:

1. To develop competency in understanding of theory of all types of gears.
2. To understand the analysis of gear train.
3. To develop competency in drawing the cam profile.
4. To make the student conversant with synthesis of the mechanism.
5. To understand step-less regulations.
6. To understand mechanisms for system control – Gyroscope

Course Outcomes:

1. Student will be able to understand fundamentals of gear theory which will be the prerequisite for gear design.
2. Student will be able to perform force analysis of Spur, Helical, Bevel, Worm and Worm gear.
3. The student to analyze speed and torque in epi-cyclic gear trains which will be the prerequisite for gear box design.
4. Student will be able to design cam profile for given follower motions and understand cam Jump phenomenon, advance cam curves.
5. The student will synthesize a four bar mechanism with analytical and graphical methods.
6. **a.** The student will analyze the gyroscopic couple or effect for stabilization of Ship Aeroplane and Four wheeler vehicle.
b. Student will choose appropriate drive for given application (stepped / step-less).

Course Code: 302044 Course Name : Turbo Machines

Course Objectives:

1. To provide the knowledge of basic principles, governing equations and applications of turbo machine.
2. To provide the students with opportunities to apply basic thermo-fluid dynamics flow equations to Turbo machines.
3. To explain construction and working principle and evaluate the performance characteristics of Turbo Machines.

Course Outcomes:

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

1. Apply thermodynamics and kinematics principles to turbo machines.
2. Analyze the performance of turbo machines.
3. Ability to select turbo machine for given application.
4. Predict performance of turbo machine using model analysis.

Course Code: 302045 Course Name : Metrology And Quality Control

Course Objectives:

Students are expected to –

1. Select suitable instrument / gauge / method of inspection for determining geometrical and dimensional measurements.
2. Calibrate measuring instruments and also design inspection gauges.
3. Understand the advances in Metrology such as use of CMM, Laser, Machine Vision System for Metrology etc.
4. Select and apply appropriate Quality Control Technique for given application.
5. Select and Apply appropriate Quality Management Tool and suggest appropriate Quality Management System (QMS).

Course Outcomes:

The student should be able to –

1. Understand the methods of measurement, selection of measuring instruments / standards of measurement, carryout data collection and its analysis.
2. Explain tolerance, limits of size, fits, geometric and position tolerances and gauge design
3. Understand and use/apply Quality Control Techniques/ Statistical Tools appropriately.
4. Develop an ability of problem solving and decision making by identifying and analyzing the cause for variation and recommend suitable corrective actions for quality improvement.

Course Code: 302046 Course Name: Skill Development

COURSE OBJECTIVES

1. To develop the skill for required in shop floor working.
2. To have knowledge of the different tools and tackles used in machine assembly shop.
3. Use of theoretical knowledge in practice.
4. 4. Practical aspect of the each component in the assembly of the machine

Course outcomes is not given

SEM-II

Course Code: 302047 Course Name : Numerical Methods and Optimization

Course Objectives:

Students are expected to –

- 1 Recognize the difference between analytical and Numerical Methods.
- 2 Effectively use Numerical Techniques for solving complex Mechanical engineering Problems.
- 3 Prepare base for understanding engineering analysis software.
- 4 Develop logical sequencing for solution procedure and skills in soft computing.
- 5 Optimize the solution for different real life problems with available constraints.
- 6 Build the foundation for engineering research.

Course Outcomes:

The student should be able to –

1. Use appropriate Numerical Methods to solve complex mechanical engineering problems.
2. Formulate algorithms and programming.
3. Use Mathematical Solver.
4. Generate Solutions for real life problem using optimization techniques.
5. Analyze the research problem

Course Code: 302048 Course Name : Design of Machine Elements – II

Course Objective:

1. Enable students to attain the basic knowledge required to understand, analyze, design and select machine elements required in transmission systems.
2. Reinforce the philosophy that real engineering design problems are open-ended and challenging
3. Impart design skills to the students to apply these skills for the problems in real life industrial applications
4. Inculcate an attitude of team work, critical thinking, communication, planning and scheduling through design projects
5. Create awareness amongst students about safety, ethical, legal, and other societal constraints in execution of their design projects
6. Develop an holistic design approach to find out pragmatic solutions to realistic domestic and industrial problems

Course Outcome:

The student should be able to –

CO 1: To understand and apply principles of gear design to spur gears and industrial spur gear boxes.

CO 2 : To become proficient in Design of Helical and Bevel Gear

CO 3: To develop capability to analyse Rolling contact bearing and its selection from manufacturer's Catalogue.

CO 4: To learn a skill to design worm gear box for various industrial applications.

CO 5: To inculcate an ability to design belt drives and selection of belt, rope and chain drives.

CO 6: To achieve an expertise in design of Sliding contact bearing in industrial applications

Course Code: 302049 Course Name : Refrigeration and Air Conditioning

Prerequisites:

Basic Thermodynamics- Laws of thermodynamics, Ideal gas processes, Thermodynamic cycles, Properties of pure substance, Mollier Charts, Basic Psychrometry terms and process, Fluid properties, Fluid dynamics, Modes of heat transfer, Governing Equations in Heat Transfer, Extended Surfaces, Condensation and Boiling, Heat Exchangers.

Course Objectives:

- Learning the fundamental principles and different methods of refrigeration and air conditioning.
- Study of various refrigeration cycles and evaluate performance using Mollier charts and/ or refrigerant property tables.
- Comparative study of different refrigerants with respect to properties, applications and environmental issues.
- Understand the basic air conditioning processes on psychrometric charts, calculate cooling load for its applications in comfort and industrial air conditioning.
- Study of the various equipment-operating principles, operating and safety controls employed in refrigeration air conditioning systems

Course Outcomes:

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

- Illustrate the fundamental principles and applications of refrigeration and air conditioning system
- Obtain cooling capacity and coefficient of performance by conducting test on vapour compression refrigeration systems
- Present the properties, applications and environmental issues of different refrigerants
- Calculate cooling load for air conditioning systems used for various
- Operate and analyze the refrigeration and air conditioning systems.

Course Code: 302050 Course Name : Mechatronics

Course Objectives:

- Understand key elements of Mechatronics system, representation into block diagram
- Understand concept of transfer function, reduction and analysis
- Understand principles of sensors, its characteristics, interfacing with DAQ microcontroller
- Understand the concept of PLC system and its ladder programming, and significance of PLC systems in industrial application
- Understand the system modeling and analysis in time domain and frequency domain.
- Understand control actions such as Proportional, derivative and integral and study its significance in industrial applications

Course Outcomes:

On completion of the course, students will be able to –

- Identification of key elements of mechatronics system and its representation in terms of block diagram
- Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O
- Interfacing of Sensors, Actuators using appropriate DAQ micro-controller
- Time and Frequency domain analysis of system model (for control application)
- PID control implementation on real time systems
- Development of PLC ladder programming and implementation of real life system.

Course Code: 302051 Course Name : MANUFATCURING PROCESS – II

Course Objective:

1. To analyze and understand the metal cutting phenomena.
2. To select process parameter and tools for obtaining desired machining characteristic
3. To understand principles of manufacturing processes.

Course Outcome:

1. Student should be able to apply the knowledge of various manufacturing processes.
2. Student should be able to identify various process parameters and their effect on processes.
3. Student should be able to figure out application of modern machining.
4. Students should get the knowledge of Jigs and Fixtures for variety of operations

Course Code: 302052 Course Name : MACHINE SHOP – II

Course Objective:

1. To set the manufacturing set-up appropriately and study the corresponding set up parameters.
2. To select appropriate process parameter for obtaining desired characteristic on work piece.
3. To understand the operational problems and suggest remedial solution for adopted manufacturing process.

Course Outcome:

1. Ability to develop knowledge about the working and programming techniques for various machines and tools

Course Code: 302053 Course Name : SEMINAR

Prerequisite- Not given

Course Objective:

1. Identify and compare technical and practical issues related to the area of course specialization.
2. Outline annotated bibliography of research demonstrating scholarly skills.
3. Prepare a well organized report employing elements of technical writing and critical thinking.
4. Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting

Course Outcome:

With this seminar report and presentation, the student is expected to learn/achieve the following:

- Establish motivation for any topic of interest and develop a thought process for technical presentation.
- Organize a detailed literature survey and build a document with respect to technical publications.
- Analysis and comprehension of proof-of-concept and related data.
- Effective presentation and improve soft skills.
- Make use of new and recent technology (e.g. Latex) for creating technical reports

Course Code: 302054 Course Name : Audit Course I :- Fire & Safety Technology

Description:

To generate, develop and sustain a voluntary movement on Fire & Safety Engineering at the National Level aimed at educating and influencing society to adopt appropriate policies, practices and procedures that prevent and mitigate human suffering and economic loss arising from all types of accidents.

Course Objective:

On completion of this Basic Fire Safety Course, participants will be able to:-

- Describe the chemistry of fire
- Identify fire hazards in the workplace
- Follow evacuation procedures
- Select and use appropriate firefighting equipment

Course Outcome:

- **Students will be able**

1. To create and sustain a community of learning in which students acquire knowledge in fire, safety and hazard management and learn to apply it professionally with due consideration for ethical, human life & property safety issues. 2. To pursue research and development in fire safety engineering, hazard management and disseminate its findings. 3. To meet the challenges of today and tomorrow in the most effective, efficient and contemporary educational manner. 4. To help in building national capabilities in fire safety engineering, disaster management, hazard management, industrial safety education through practical training to ensure a fire safe nation.

Course Code: 302054 Course Name : Audit Course II - Entrepreneurship Development

Description:

EDP is a program meant to develop entrepreneurial abilities among the people. In other words, it refers to inculcation, development, and polishing of entrepreneurial skills into a person needed to establish and successfully run his enterprise. Thus, the concept of entrepreneurship development programme involves equipping a person with the required skills and knowledge needed for starting and running the enterprise.

This course will help in developing the awareness and interest in entrepreneurship and create employment for others. Students get familiar with the characteristics and motivation of successful entrepreneurs. Students learn how to identify and refine market opportunities, how to secure financing, how to develop and evaluate business plans and manage strategic partnerships. Students learn various concepts including the basics of management, leadership, motivation, decision-making, conflict management, human resource development, marketing and sustaining an organization. Students also get basic knowledge of accounting practices and finance. The core course in Entrepreneurship Development & Management equips students with skills and knowledge required to start and sustain their own business.

Course Objective:

- To impart basis managerial knowledge and understanding;
- Develop and strengthen entrepreneurial quality, i.e., motivation or need for achievement.
- To analyze environmental set up relating to small industry and promoting it.
- Collect and use the information to prepare project report for business venture.
- Understand the process and procedure involved in setting up small units.
- Develop awareness about enterprise management.

Course Outcome:

The students will be able to

- Appreciate the concept of Entrepreneurship
- Identify entrepreneurship opportunity.
- Develop winning business plans

Course Code: 302054 Course Name : Audit Course III - Intellectual Property Right

Objective:

Intellectual property refers to the rights which are attached to the creation of the mind and which take the form of a property. Though intangible in nature, intellectual property has become the driving force of many companies today. Fortune 500+ companies undoubtedly are the best examples of what a company can achieve through the proper understanding and management of IPR.

Thus the study of intellectual property rights is inevitable for managers, considering the fact that India is fast emerging as an economy with considerable investment in cutting-edge research and development. India is also emerging as an economy where foreign companies propose to invest considerably, both technically and financially, provided proper protection is guaranteed to their intangible assets which form the cornerstone of their business.

Course Code: 302054 Course Name : Audit Course IV - Lean Management

Course Objective:

- To learn Lean Thinking and its applications
- To get knowledge of Tools & Techniques used in Lean Management
- To understand Business Impact of Lean Management

Course Outcome: Students

- Will be able to do practice Lean Management at the workplace
- Will be able to contribute in Continuous Improvement program of the Organization

Course Code: 302054 Course Name : Audit Course V - Smart Manufacturing

Description:

Smart Manufacturing is an amalgamation of Information Technology, Cloud Computing & traditional Mechanical, Production Engineering towards achieving excellence in manufacturing. Maximum results with minimum resources being used. The course will introduce the concepts of Smart Manufacturing, how various technologies can be leveraged to achieve minimum breakdowns, First Time Right Production, 100% Delivery on Time with minimum turnaround time. Nine Pillars of Smart Manufacturing will be explained to the Students.

The course will make the students aware of developments in Technology those are going to alter the Traditional Manufacturing scenario. The following topics may be broadly covered in the classroom. The practical will be in the form of Group Discussion based on Case Study.

Course Objective:

- To know more about Smart Manufacturing & Industry 4.0
- To get knowledge of various converging Technologies
- To prepare ourselves for the ever changing Manufacturing Techniques

Course Outcome: The students will be

- Comfortable with terminology and practices in Smart Manufacturing
- Able to face the challenges in Industry & also contribute towards advancement.
- Active part of Industry 4.0 (Fourth Industrial Revolution)