



CAYMET's
Siddhant College of Engineering
Savitribai Phule Pune University, Pune
Fourth Year Mechanical Engineering (2015 Course)
COURSE OBJECTIVE & OUTCOMES

SEM I

Subject Code & Name -402041 Hydraulics and Pneumatics

Course Objectives

1. To study governing laws used in fluid power systems
2. To study fluid power applications
3. To study working principles of various components
4. To study selection of different components
5. To study how to design fluid power systems
6. To study low cost automation

Course Outcomes

1. Understand working principle of components used in hydraulic & pneumatic systems
2. Identify various applications of hydraulic & pneumatic systems
3. Selection of appropriate components required for hydraulic and pneumatic systems
4. Analyse hydraulic and pneumatic systems for industrial/mobile applications
5. Design a system according to the requirements
6. Develop and apply knowledge to various applications

Subject Code & Name – 402042 CAD CAM and Automation

Course Objectives

1. To apply homogeneous transformation matrix for geometrical transformations of 2D/3D CAD entities
2. To model mathematically analytical and synthetic curves, surfaces
3. To predict performance of simple mechanical components viz. beam, shafts, plates, trusses using FEA (Mathematical and Software treatment)
4. To generate CNC program for appropriate manufacturing techniques viz. turning and milling
5. To select and apply suitable Rapid Prototyping techniques for engineering applications
6. To study role and components of different Automation strategies.

Course Outcomes

1. Apply homogeneous transformation matrix for geometrical transformations of 2D CAD entities for basic geometric transformations.
2. Use analytical and synthetic curves and surfaces in part modeling.
3. Do real times analysis of simple mechanical elements like beams, trusses, etc. and comment on safety of engineering components using analysis software.
4. Generate CNC program for Turning / Milling and generate tool path using CAM software.
5. Demonstrate understanding of various rapid manufacturing techniques and develop competency in designing and developing products using rapid manufacturing technology.
6. Understand the robot systems and their applications in manufacturing industries.

Subject Code & Name – 402043 Dynamics of Machinery

Course Objectives

1. To conversant with balancing problems of machines.
2. To understand fundamentals of free and forced vibrations.
3. To develop competency in understanding of vibration and noise in Industry.
4. To develop analytical competency in solving vibration problems.
5. To understand the various techniques of measurement and control of vibration and noise.

Course Outcomes

1. Apply balancing technique for static and dynamic balancing of multi cylinder inline and radial engines.
2. Estimate natural frequency for single DOF undamped & damped free vibratory systems.
3. Determine response to forced vibrations due to harmonic excitation, base excitation and excitation due to unbalance forces.
4. Estimate natural frequencies, mode shapes for 2 DOF undamped free longitudinal and torsional vibratory systems.
5. Describe vibration measuring instruments for industrial / real life applications along with suitable method for vibration control.
6. Explain noise, its measurement & noise reduction techniques for industry and day to day life problems.

Subject Code & Name – 402044 A Elective – I Finite Element Analysis

Course Objectives

1. To understand the philosophy and general procedure of Finite Element Method as applied to solid mechanics and thermal analysis problems.
2. To familiarize students with the displacement-based finite element method for displacement and stress analysis and to introduce related analytical and computer tools.
3. It provides a bridge between hand calculations based on mechanics of materials and machine design and numerical solutions for more complex geometries and loading states.
4. To study approximate nature of the finite element method and convergence of results are examined.
5. It provides some experience with a commercial FEM code and some practical modeling exercises.

Course Outcomes

1. Understand the different techniques used to solve mechanical engineering problems.
2. Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.
3. Apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results.
4. Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis.
5. Use commercial finite element analysis software to solve complex problems in solid mechanics and heat transfer.
6. Interpret the results of finite element analyses and make an assessment of the results in terms of modeling (physics assumptions) errors, discretization (mesh density and refinement toward convergence) errors, and numerical (round-off) errors.

Subject Code & Name – 402044 B Elective – I Computational Fluid Dynamics

Course Objectives

1. Students should be able to model fluid / heat transfer problems and apply fundamental conservation principles.
2. Students should be able to discretize the governing equations by Finite Difference Method and Finite volume Method.
3. Students should be able to develop programming skills by in-house code development for conduction, convection and fluid dynamics problems.
4. Students should be able to solve basic convection and diffusion equations and understand the role

in fluid flow and heat transfer.

5. To prepare the students for research leading to higher studies.
6. To prepare the students for career in CAE industry using software tools

Course Outcomes

1. Analyze and model fluid flow and heat transfer problems.
2. Generate high quality grids and interpret the correctness of numerical results with physics.
3. Conceptualize the programming skills.
4. Use a CFD tool effectively for practical problems and research.

Subject Code & Name – 402044 C Heating, Ventilation, Air Conditioning and Refrigeration Engineering

Course Objectives

1. To understand the recent vapour compression cycle
2. To provide the knowledge of analyze thermal design of refrigeration system components
3. To understand practical aspects of vapour compression system
4. To provide the knowledge of basic concepts of ventilation, infiltration and space distribution techniques
5. To inculcate techniques of estimating building envelop load.
6. To understand the working non-conventional air-conditioning systems.

Course Outcomes

1. Determine the performance parameters of trans-critical & ejector refrigeration systems
2. Estimate thermal performance of compressor, evaporator, condenser and cooling tower.
3. Describe refrigerant piping design, capacity & safety controls and balancing of vapor compressor system.
4. Explain importance of indoor and outdoor design conditions, IAQ, ventilation and air distribution system.
5. Estimate heat transmission through building walls using CLTD and decrement factor & time lag methods with energy-efficient and cost-effective measures for building envelope.
6. Explain working of types of desiccant, evaporative, thermal storage, radiant cooling, clean
7. room and heat pump air-conditioning systems.

Subject Code & Name – 402045 A Elective – II Automobile Engineering

Course Objectives

1. To make the student conversant with fundamentals of automobile systems.

2. To develop competencies in performance analysis of vehicles.
3. To make the student conversant with automobile safety, electrical system and vehicle maintenance.
4. To understand the emerging trends of electric vehicles hybrid electric vehicles and solar vehicles.

Course Outcomes

1. To compare and select the proper automotive system for the vehicle.
2. To analyse the performance of the vehicle.
3. To diagnose the faults of automobile vehicles.
4. To apply the knowledge of EVs, HEVs and solar vehicles

Subject Code & Name – 402045 B Elective – II Operation Research

Course Objectives

1. To familiarize the students with the use of practice oriented mathematical applications for optimization functions in an organization.
2. To familiarize the students with various tools of optimization, probability, statistics and simulation, as applicable in particular scenarios in industry for better management of various resources.

Course Outcomes

1. Apply LPP and Decision Theory to solve the problems
2. Apply the concept of transportation models to optimize available resources.
3. Decide optimal strategies in conflicting situations.
4. Implement the project management techniques.
5. Minimize the process time
6. Optimize multi stage decision making problems

Subject Code & Name – 402045 C Elective – II Energy Audit and Management

Course Objectives

Following concepts to be taught to the students,

1. Importance of Energy Management.
2. To Carry out Energy Audit.
3. Methods to reduce consumption of energy and save cost.
4. To improve energy efficiency of overall system.
5. Significance of Waste heat recovery and Cogeneration.

Course Outcomes

1. Compare energy scenario of India and World.

2. Carry out Energy Audit of the Residence / Institute/Organization.
3. Evaluate the project using financial techniques
4. Identify and evaluate energy conservation opportunities in Thermal Utilities.
5. Identify and evaluate energy conservation opportunities in Electrical Utilities.
6. Identify the feasibility of Cogeneration and WHRUse a CFD tool effectively for practical problems and research.

Subject Code & Name – 402046 Project – I

Course Objectives

1. To have ideology of the industrial project.
2. Hands on working with tools, tackles and machines
3. To carry out literature survey
4. To do brain storming for mechanical engineering system

Course Outcomes

1. Find out the gap between existing mechanical systems and develop new creative new mechanical system.
2. Learn about the literature review
3. Get the experience to handle various tools, tackles and machines

SEM II

Subject Code & Name – 402047 Energy Engineering

Course Objectives

1. To study the power generation scenario, the components of thermal power plant, improved Rankin cycle, Cogeneration cycle
2. To understand details of steam condensing plant, analysis of condenser, the an environmental impacts of thermal power plant, method to reduce various pollution from thermal power plant
3. To study layout, component details of hydroelectric power plant, hydrology and elements , types of nuclear power plant
4. To understand components; layout of diesel power plant , components; different cycles ; methods to improve thermal efficiency of gas power plant
5. To study the working principle , construction of power generation from non-conventional sources of energy
6. To learn the different instrumentation in power plant and basic so economics of power generation.

Course Outcomes

1. Describe the power generation scenario, the layout components of thermal power plant and analyze the improved Rankin cycle, Cogeneration cycle
2. Analyze the steam condensers, recognize the an environmental impacts of thermal power plant and method to control the same
3. Recognize the layout, component details of hydroelectric power plant and nuclear power plant
4. Realize the details of diesel power plant, gas power plant and analyze gas turbine power cycle
5. Emphasize the fundamentals of non-conventional power plants
6. Describe the different power plant electrical instruments and basic principles of economics of power generation.

Subject Code & Name – 402048 Mechanical System Design

Course Objectives

1. To develop competency for system visualization and design.
2. To enable student to design cylinders and pressure vessels and to use IS code.
3. To enable student select materials and to design internal engine components.
4. To introduce student to optimum design and use optimization methods to design mechanical components.

5. To enable student to design machine tool gearbox.
6. To enable student to design material handling systems.
7. Ability to apply the statistical considerations in design and analyze the defects and failure modes in components.

Course Outcomes

1. Understand the difference between component level design and system level design.
2. Design various mechanical systems like pressure vessels, machine tool gear boxes, material handling systems, etc. for the specifications stated/formulated.
3. Learn optimum design principles and apply it to mechanical components.
4. Handle system level projects from concept to product.

Subject Code & Name – 402049 A Elective – III Tribology

Course Objectives

1. To provide the knowledge and importance of Tribology in Design, friction, wear and lubrication aspects of machine components.
2. To select proper grade lubricant for specific application.
3. To understand the principles of lubrication, lubrication regimes, theories of hydrodynamic and the advanced lubrication techniques.
4. To introduce the concept of surface engineering and its importance in tribology.
5. To understand the behaviour of Tribological components.

Course Outcomes

1. The course will enable the students to know the importance of Tribology in Industry.
2. The course will enable the students to know the basic concepts of Friction, Wear, Lubrications and their measurements.
3. This course will help students to know the performance of different types of bearings and analytical analysis thereof.
4. This course will help students to apply the principles of surface engineering for different applications of tribology.

Subject Code & Name – 402049 B Elective – III Industrial Engineering

Course Objectives

1. To introduce the concepts, principles and framework of contents of Industrial Engineering.
2. To acquaint the students with various productivity enhancement techniques.

3. To acquaint the students with different aspects of Production Planning and Control and Facility Design.
4. To introduce the concepts of various cost accounting and financial management practices as applied in industries.
5. To acquaint the students with different aspects of Human Resource activities and Industrial Safety rules.
6. To acquaint students with different aspect of simulation modeling for various industrial engineering applications.

Course Outcomes

1. Apply the Industrial Engineering concept
2. Understand, analyze and implement different concepts involved in method study.
3. Design and Develop different aspects of work system and facilities.
4. Understand and Apply Industrial safety standards, financial management practices.
5. Undertake project work based on modelling & simulation area.

Subject Code & Name – 402049 C Elective – III Robotics

Course Objectives

1. To get acquainted with basic components of robotic systems.
2. To study various gripper mechanisms and sensors and understand role of suitable control system.
3. To understand statistics & kinematics of robots
4. To develop competency in obtaining desired motion of the robot.
5. To study various programming methods in robotics.
6. To understand need of modern techniques in robotics

Course Outcomes

1. Identify different type of robot configuration with relevant terminology.
2. Select suitable sensors, actuators and drives for robotic systems.
3. Understand kinematics in robotic systems.
4. Design robot with desired motion with suitable trajectory planning.
5. Select appropriate robot programming for given application.
6. Understand need of IoT, machine learning, simulation in robotics.

Subject Code & Name – 402050 A Elective – IV Advanced Manufacturing Processes

Course Objectives

1. To analyze and identify applications of special forming processes
2. To analyze and identify applications of advanced joining processes
3. To understand and analyze the basic mechanisms of hybrid non-conventional machining techniques
4. To understand various applications and methods of micro and nano fabrication techniques
5. To understand advanced Additive Manufacturing (AM) technology for innovations in product development
6. To understand various material characterization techniques.

Course Outcomes

1. Classify and analyze special forming processes
2. Analyze and identify applicability of advanced joining processes
3. Understand and analyze the basic mechanisms of hybrid non-conventional machining techniques
4. Select appropriate micro and nano fabrication techniques for engineering applications
5. Understand and apply various additive manufacturing technology for product development
6. Understand material characterization techniques to analyze effects of chemical composition, composition variation, crystal structure, etc.

Subject Code & Name – 402050 C Elective – IV Product Design and Development

Course Objectives

To explain student's significance of

1. Product design and Product development process
2. Customer needs, satisfaction and commercialization of product
3. Forward & Reverse Engineering and its role in designing a product
4. Design Aspects (DFA, DFMEA, Design for Reliability and Safety)
5. Product Life Cycle Management and Product Data Management

Course Outcomes

On completion of the course, students will be able to

1. Understand essential factors for product design
2. Design product as per customer needs and satisfaction
3. Understand Processes and concepts during product development
4. Understand methods and processes of Forward and Reverse engineering
5. Carry various design processes as DFA, DFMEA, design for safety

6. Understand the product life cycle and product data management
