

**S. E. (Mechanical) Part - I**  
**M-201 – Engineering Mathematics - III**

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**Course Objective**

- i) To develop logical understanding of the subject.
- ii) To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem from Engineering fields.
- iii) To make aware students about the importance and symbiosis between Mathematics and Engineering.

**Course Outcomes**

- i) Student will demonstrate basic knowledge of L.D.E., P.D.E., Vector & F.T.
- ii) Student will show the understanding of impact of Engg. Mathematics on Mech.
- iii) Student will Demonstrate their understanding of mathematical ideas from multiple perspectives, such as by
  - (a) using the internal connections between geometry, algebra, and numerical computation,
  - (b) applying the connections between theory and applications, or
  - (c) distinguishing between a formal proof and a less formal arguments and understanding the different roles these play in mathematics.

**M-202 – Engineering Thermodynamics**

**Course Objective**

- 1. To understand the concept of quantity and quality of energy
- 2. To understand use of steam for power generation and process heating
- 3. To prepare the student to effectively use thermodynamics, in the practice of engineering.
- 4. To lay the ground work for subsequent studies in such fields as fluid mechanics, heat transfer etc.

**Course outcomes:**

At the end of course, the student will able to

- 1. Apply fundamental concepts of thermodynamic to solve real life engineering problems
- 2. Identify problems & analyse power producing and consuming devices.
- 3. To apply fundamentals of engineering thermodynamics to compressors .

## **M-203 – ENGINEERING METALLURGY**

### **Course Objectives:**

The syllabus of Engineering Metallurgy is designed with a view of providing the following to the students:

1. The basic structure of metals:- Their atomic arrangement, Crystalline Morphology, Defects in the Crystal, Effects of Dislocations
2. Effects of Alloying and Heat Treatment on the Mechanical properties of metals.
3. Surface Treatments for selective surface hardening and Advanced Metallurgical processes like powder metallurgy.
4. Composite materials, Polymers and Super Alloys.

### **Course outcomes:**

At the end of course, the student will be able to

1. Apply fundamental concepts of Metallurgy to solve real life engineering problems.
2. Identify problems and suggest suitable material/ heat treatment to get the requisite mechanical properties for a given application.
3. To apply advanced Metallurgical techniques to solve numerous engineering problems

## **M-204 – MECHANICAL MEASUREMENTS AND METROLOGY**

### **Course Objectives:-**

- To understand the basic principles, construction and working of engineering mechanical measurement science.
- To acquire proficiency in using, calibrating various measurement systems.
- To understand the problems in measurement system and develop the competency to resolve the problems.
- To know all the measuring instruments and to measure different parameters in day-to-day-work.
- **Course Outcomes:**
- After going through basic study of generalized measurement system, students will be able to understand the stepwise working of all instruments and will be able to find out the output factors.
- They will be able to know the importance of all factors affecting on output of instruments i.e. errors.

- They can suggest some points in the design & working of instruments after studying the basics of metrology.
- Students will be able to differentiate between all types of measurements i.e. Direct & indirect type, contact & non-contact type as well as they can design the components with provisions of tolerance in manufacturing through the concepts of metrology.

## **M-205 – Strength of Materials**

### **Course Objectives:**

- To establish an understanding of the fundamental concepts of mechanics of deformable solids; including static equilibrium, geometry of deformation, and material constitutive behavior.
- Mechanical behavior of the body by determining the stresses, strains and deflections produced by the loads up to the elastic limit.
- Fundamental concepts related to deformation, strain energy, moment of inertia, load carrying capacity, slope and deflection of beams, shear forces, bending moments, torsional moments, column and struts, principal stresses and strains and theories of failure.
- To provide students with exposure to the systematic methods for solving engineering problems in solid mechanics.

### **Course Outcomes:**

Student will be able to understand the concepts of various stresses and their significant effects in context with engineering applications.

- Student will be able to effectively use the concepts of shear force and bending moment diagrams in design of machine elements.
- Will be able to compute the principal stresses and Strains by analytical and graphical methods (Mohr's circle of stress 2-D).
- Able to use expressions for estimation of deformation in axially loaded members under gradual, sudden and impact loads.
- Able to estimate the Slope and Deflection in determinate beams.
- This subject enables the student to understand the important concepts of stress and strain, their significance in context with engineering applications and is useful while studying the subjects like, Machine Design, Theory of machines, Dynamics of Machines.

## **M-206 – Engineering Mathematics - IV**

### **Course Objective**

- i) To develop logical understanding of the subject.
- ii) To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem from Engineering fields.
- iii) To make aware students about the importance and symbiosis between Mathematics and Engineering.

### **Course Outcomes**

- i) Student will demonstrate basic knowledge of Functions of Complex Variable & Numerical Technique.
- ii) Student will show the understanding of impact of Engg. Mathematics on Mech.
- iii) Student will Demonstrate their understanding of mathematical ideas from multiple perspectives, such as by (a) using the internal connections between geometry, algebra, and numerical computation, (b) applying the connections between theory and applications, or (c) distinguishing between a formal proof and a less formal arguments and understanding the different roles these play in mathematics.

## **M-207- Theory of Machines**

### **COURSE OBJECTIVES:**

Mechanical devices are characterized by the fact that they have mobility and must move to function. This differentiates mechanical engineering from other fields of engineering such as civil engineering, in which structures are generally immobile, and electrical engineering, in which one is concerned with the motion of electrons and not structures. The study of kinematics and dynamics of machinery is an applied field of mechanical engineering that is concerned with understanding the relationship between the geometry and the motions of the parts of a machine and the forces that produce this motion. The overall objective of this course is to learn how to analyze the motions of mechanisms, design mechanisms to have given motions, and analyze forces in machines. This includes relative motion analysis and design of gears, gear trains, cams, and linkages, simultaneous graphical and analytical analysis of position, velocity, and acceleration, considering static and inertial forces.

### **COURSE OUTCOMES:**

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

1. Identify the basic relations between distance, time, velocity, and acceleration.
2. Apply vector mechanics as a tool for problem solving techniques.
3. Distinguish the basics of kinematics and kinetics of motion.
4. Develop familiarity with application of kinematics theories to real-world machines.
5. Understand analytical linkage analysis.
6. Determine cam profiles.
7. Understand gear trains.

8. Use the techniques to study the motions of machines and their components.
9. Use the techniques, skills, and modern engineering tools necessary for engineering practice.

## **M-208 – Manufacturing Technology – I**

### **Objectives:-**

- To understand the primary manufacturing process classification and use in mechanical engineering.
- To acquire the knowledge of casting, metal forming and metal joining processes from the point of view of tools and equipments required, materials processed ,process parameters
- To get the practical exposure of utilization of manufacturing techniques for product making through practical and industry visit

### **Outcome:**

- Ability to classify and apply the knowledge gained for applicability of processes for different product manufacturing.
- To compare and select best suitable manufacturing process based on requirements, advantages, limitations and applications

## **M-209 – Fluid Mechanics & Hydraulics Machines**

### **COURSE OBJECTIVES :**

1. To understand the properties of fluids and their variations with respect to temperature and pressure.
2. To understand the principles of fluid mechanics governing the behaviour of fluids at rest and in motion.
3. To understand the working principles of hydraulic turbines and pumps.
4. To understand the physics of fluid flow and its applications.
5. To know the losses in flowing fluids in pipes.

### **COURSE OUTCOMES :**

At the end of this course, the student will have

1. An ability to identify, formulate and solve problems related to fluids at rest and in motion.
2. Knowledge to design pipeline systems, floating bodies and hydraulic gates.
3. Knowledge to design hydraulic turbines and pumps.

## **M-210 - Machine Drawing and CAD**

### **Course Objectives:**

1. To visualize an object & convert it into a drawing.
2. To gain knowledge of conventional representation of various machining & mechanical details.
3. To become conversant with 2-D & 3-D drafting.
4. To impart solid modeling ability in to students.
5. To interpret & apply technique for making assembly from the detail/.components.

### **Course Outcomes:**

At the end of this course, the student will be:

1. Able to create drawings as per BIS standards.
2. Visualize & prepare detail drawing of a given object.
3. Read & interpret a given drawing.
4. Able to create assembly models of simple machine.

## **M-211 - PROFESSIONAL COMMUNICATION SKILLS**

### **Course Objectives:**

1. To understand the concept, process and importance of Professional Communication
2. To enable students to acquire English Speaking and Writing Skills
3. To enable students to develop Presentation Skills

### **Outcomes:**

1. Students would understand the concept, process and importance of Professional Communication
2. Students would acquire English Speaking and Writing Skills
3. Students would develop Presentation Skills

**TE (Mechanical) Part – I -CGPA**  
**Manufacturing Technology – II**

**Course Objectives:**

- iv) To understand process of cutting shaping.
- v) To understand working principles for various machining processes.
- vi) To understand construction, working and applications of various machine tools.
- vii) To learn basic set up, working and applications of a few important non conventional machining processes to get hand on experience on various machine tools.

**Course Outcomes:**

- iv) The students will be able to understand the details about machines used in production.
- v) The students will be able to understand the mechanics behind metal cutting.
- vi) The students will be able to understand the finishing and super finishing processes.
- vii) The students will be able to understand the Physics of material removal behind the various non-conventional machining processes.

**Machine Design- I**

**COURSE OBJECTIVE:**

1. To familiarize the various steps involved in the Design process
2. To understand the principles involved in evaluating the shape and dimensions of a complete to satisfy function and strength requirements.
3. Students 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 for each application.

**COURSE OUTCOMES:**

1. Ability to analyze the stress and strain of mechanical components and understand, identify and quantify failure modes for mechanical part.
2. Ability to decide optimum design parameters for mechanical systems.
3. Ability to design mechanical system for fluctuating loads.
4. Acquire skill in preparing production drawing pertaining to various designs.

## **Heat Transfer**

### **Course Objectives:**

1. Study and analysis of heat transfer concepts applicable for steady state with and without heat generation and transient conditions.
2. To Train the students to identify, formulate and solve problems involving forced convection & natural convection heat transfer.
3. Students should learn the phenomena of heat transfer during phase change (boiling and condensation heat transfer)
4. The course provides practical exposure to the students in heat transfer equipments like heat exchanger, heat pipes, fins etc.

### **COURSE OUTCOMES:**

1. Understand the modes of heat transfer and basic laws of heat transfer.
2. Analyze the problems involving steady state heat conduction with and without internal heat generation.
3. Develop solutions for transient heat conduction.
4. Understand and Evaluate heat transfer coefficients for natural and forced convection.
5. Analyze the heat exchanger and fins performance.
6. Calculate radiation heat transfer between black body and gray body surfaces.

## **MECHATRONICS – I**

### **COURSE OBJECTIVES:**

1. Understand the key elements of Mechatronic system, representation into block diagram.
2. Understand principles of Sensors, their characteristics.
3. Understand Mathematical modeling of systems.
4. Study various actuators applicable to Mechatronic systems.
5. Study of Interfacing of different electronic and electro - mechanical devices.

### **COURSE OUTCOMES:**

1. Develop the skill to identify the suitable sensor and actuator for a Mechatronic system.
  2. Develop the skill required for interfacing the electronic and electro-mechanical systems.
  3. Develop the skill to indigenously design and develop a Mechatronic system.
  4. Develop the skill to model a complete automated electro-mechanical system.
  5. Understand the working and use of hydraulic and pneumatic actuators
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## **CAD/CAM**

### **CAD**

#### **Course Objectives**

- i) To introduce field of Intelligent CAD/CAM with particular focus on engineering product design and manufacturing.
- ii) To develop a holistic view of initial competency in engineering design by modern computational methods.
- iii) To understand concepts of geometric modeling.
- iv) Provide theoretical background of CAD/CAM.
- v) Introduce Rapid Prototyping techniques.

**Course Outcome:** A learner will be able to....

- 1. Identify proper computer graphics techniques for geometric modeling.
- 2. Transform, manipulate objects, store and manage data.
- 3. Prepare computer assisted part program and post process.
- 4. Prepare part programming applicable to CNC machines.
- 5. Use rapid prototyping and tooling concepts in any real life applications.

## **TOOL ENGINEERING**

#### **Course Objectives:**

- To introduce students to the design of dies for presswork.
- To introduce students the importance of using Jigs and Fixtures in manufacturing.
- To introduce students to the design practices of Jigs & Fixtures

#### **Course outcomes:**

After Studying the subject students will be able to know:

- Selection of a die for a given component
- Classify and explain various press tools and press tools operations
- Selection of locating and clamping devices for given component.
- Select and design jig and fixture for given component.

# MACHINE DESIGN - II

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## **COURSE OBJECTIVE:**

1. To familiarize the various steps involved in the design process of mechanical drives such as belt, chain, rope and gear.
2. To understand the procedure of selection of machine elements from manufacturers catalogue.
3. To get knowledge of different types of bearings and their selection for a particular application.
4. Student shall apply design knowledge of the different types of elements used in the machine design process, for a design project.

## **COURSE OUTCOMES:**

1. Design and analyze belts, brakes, clutches.
2. Understand gear drives and their applications; design procedure and introduction to gear design standard practices.
3. The construction, working, important features and selection process from manufacturers catalogue for rolling contact bearings
4. Analyze the pressure distribution and design of journal bearings.

## **Power Developing Devices**

### **Course Objectives:**

4. To understand the basic working of SI and CI Engines and Air Standard cycles.
5. To understand the Fuel Supply system for SI and CI Engines.
6. To understand the Testing and Performance of SI and CI Engines.
7. To understand the Combustion Phenomenon of SI and CI Engines.
8. To understand the Performance and Analysis of Gas Turbine.

### **Course Outcomes:**

The Learner is able to ---

3. Differentiate between SI and CI Engines.
4. Understand and explain Combustion of SI and CI Engines.
5. Plot and analyze Performance Characteristics of SI and CI Engines.
6. Explain Gas Turbine and its performance.

## **MECHATRONICS – II**

### **COURSE OBJECTIVES:**

1. Understand key elements of industrial Pneumatic systems principal and components and circuit design
2. Understand key elements of industrial hydraulic systems principal and components and circuit design.
3. Understanding Electrical ,Mechanical Actuators and components Like switches relays etc. Also basis of application and selection of drives for various applications.
4. Understand the concept of PLC system and its ladder programming, and significance of PLC systems in industrial application.
5. Understand Advance control in Mechatronics and Robotics.

### **COURSE OUTCOMES:**

1. Student shall understand Basic component and design of pneumatic systems.
2. Student shall understand Basic component and design of HYDRULIC systems.
3. Student To understand the signal conditioning phenomenon, necessity, and outline.
4. Student to understand concept of PLC its industrial use, application to Mechatronics.
5. Student shall Development of PLC ladder programming and implementation of

real life system Hydraulics+Pneumatics + Electrical Electronics +Plc .

## **EL-I (01) Dynamics of Machines**

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### **Course Objectives:**

1. To understand the concept of balancing of rotating and reciprocating masses.
2. To understand the force analysis of reciprocating engine.
3. To study different types of gear trains.
4. To understand the concept of vibrations, single degree of freedom systems and the forced vibrations.
5. To study different types of Governors and its functions.

### **Course Outcome:-**

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

1. Apply mathematical principles to perform dynamic force analysis on machine components.
2. Establish methods for balancing of machine components.
3. Analyze free vibration of various systems.
4. Analyze forced vibration of various systems.
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## **EL-I (02) Power Plant Engineering**

### **Course Objectives:**

1. To develop an ability to apply knowledge of Mathematics and Thermal Sciences
2. To develop an ability to design a system component and processes to meet the desired needs of Power Plant.

### **Course Outcomes:**

1. Ability to have adequacy with design, erection and development of Power Plant.
2. Optimization of Power Plants with respect to available resources.

## **EL-I (03) Industrial Engineering**

### **Course Objectives:**

To introduce students:

1. The concept of integration of various resources.
2. To acquire the knowledge of complex processes or system required to accomplish the tasks.
3. To acquaint various ways to eliminate waste of time, money, material and energy that do not generate the value.
4. The various cost accounting systems.
5. The various mental fatigue at work place.

### **Course Outcomes:**

After studying the subject students will be able to:

1. Identify the specific areas for a particular job execution in manufacturing business organization.
2. Know the key areas having chance of waste occurrence and its reduction possibilities.
3. Optimize resource utilization.
4. Carryout cost estimation and analysis.
5. Find their convenience to do the job.

## **EL-I (05) MICRO ELECTRO MECHANICAL SYSTEMS (MEMS)**

### **Course Objectives**

The syllabus of MEMS is designed with a view of providing the following to the students:

1. Basics of MEMS technology.
2. Fundamental Devices and Processes for MEMS, Transducers and Actuators.
3. Micro fluidic devices and materials like Bio MEMS and Biomaterials.
4. MEMS Packaging and Assembly, MEMS device simulation.

### **Course Outcomes**

At the end of course, the student will able to

1. Apply fundamental concepts of MEMS to solve real life engineering problems.
2. Identify problems and suggest suitable MEMS material/ Devices/Process to get the Requisite Solution for a given application.
3. Apply advanced MEMS techniques to solve future engineering problems.

## **B. E. (Mechanical) Part - I**

### **Refrigeration and Air Conditioning**

#### **Course Objectives:**

The major Power Consuming devices are refrigerators and Air Conditioners. The main objective of this course is to understand the working principle of Refrigerator and Air conditioning and to operate them with minimum consumption of power in minimum time.

The student should understand how to operate the Refrigerator and Air conditioner, their working principle, various operating cycles such as vapor compression cycle, Air compression cycle, multi compression system, Vapor absorption cycle with numerical calculations.

He/she should know the psychrometry and various properties of air, GSHF, RSHF, humidification, Dehumidification, various components and their types for air conditioners and Refrigerators such as compressors, condensers, evaporators, throttle device and temperature and pressure controllers.

Except understanding of working principle, he should know various types of Refrigerants and how to choose them in a system to operate it smoothly with minimum cost and minimum maintenance.

#### **Course Outcomes:**

In order to assess the students progress in the subject towards achieving knowledge and learning. He/She is assessed by conducting three tests in the semester , He/She is assigned minimum five assignments, home work problems, Solving University Question papers to grasp knowledge in the subject.

The various experiments were performed during practical hours to understand the basic concept and working of the Refrigeration cycle. A local cold storage plant is visited to understand the cycle of Refrigeration and Air conditioning. Finally the student is examined by conducting Practical/Oral Examination based on Term Work, Test performance and finally theory paper of University level, based on the syllabus.

The student is expected to use his subject knowledge to design the Refrigeration or Air Conditioning plant and to optimize the performance of the same. .

### **Finite Element Methods**

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#### **Course Objectives:**

1. To acquaint with applications of numerical techniques for solving problems.
2. To introduce the concepts of Mathematical Modeling of Engineering Problems.
3. To study the applicability of FEM to a range of Engineering Problems.

#### **Course Outcomes:**

1. Develop the finite element equations to model engineering problems
2. Apply the basic finite element formulation techniques to solve engineering problems.
3. Use commercial FEA software, to solve problems related to mechanical engineering

## **Advanced Machining & Manufacturing**

### **Course Objectives:**

5. To introduce the students to Advanced Manufacturing Processes.
6. To introduce the students to Modern Measurement Techniques for Micro Machining.
7. To introduce the students to

### **Course Outcomes:**

1. Selection of appropriate manufacturing process for Advance components.
2. Characterization of work piece materials.

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## **Operations Research Techniques**

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### **Course Objectives:**

4. To familiarize the students with the use of practice oriented mathematical applications for optimization functions in an organization.
5. 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.
6. Apply the various models of operation research such as assignment model, transportation model, Linear programming model, Network Model and Sequencing Model.

### **Course Outcomes:**

1. Upon successful completion of this course, the student will be able to.....
2. Illustrate the need to optimally utilize the resources in various types of industries.
3. Apply and analyze mathematical optimization functions to various applications.
4. Demonstrate cost effective strategies in various applications in industry.

## **EL-II-Tribology**

### **Course Objectives:**

1. This course is designed to understand the basic concepts of Tribology.
2. To understand the recent advances in the field of Tribology.

**Course Outcomes:**

1. Students will be able to explain various wear mechanisms.
2. Students will be able to predict theoretically as well as experimentally the life of Bearings and the components subjected to rolling and sliding friction.

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**EL-II-Renewable Energy**

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**Course Objectives**

7. Introduce to the technology of renewable source of energy
  8. Learn about the solar radiation, its applications and radiation measuring instruments.
  9. Learn about the various types of geothermal resources and its applications.
  10. Study the biomass energy resources.
  11. Learn methods of energy extraction from the wind and oceans.
  12. Learn to the technology of direct energy conversion methods.
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1. Apply the technology to capture the energy from the renewable source like Sun, Wind, Ocean, Biomass and Geothermal.
  2. Apply the direct energy conversion methods.

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**EL-II-Micro & Nano Manufacturing**

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**Course objective:**

- To understand the scope of micro and nano technology:
- To understand the concepts and Applications of micro- and nanofabrication
- To understand Nano technology in India
- To understand the scope for Microfabrication
- To understand commercialization Issues of Micro-Nano Technology

**Course outcome:**

Students will have a complete understanding of scope, concepts and applications of micro and nano technology in the field of manufacturing.

## **EL-II-Industrial Product Design**

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### **Course objective:**

- 1.To understand the structure of Industrial product design processes
2. To understand the contributions and role of multiple functions for creating a new product
3. To apply engineering knowledge for the design of new style innovative and market acceptable products.
4. To develop an ability to coordinate multiple, interdisciplinary tasks in order to achieve the mission and goals of the product design.

### **Course outcome:**

1. Acquire the skills in understanding the Industrial Product Design.
2. Acquire the skill in style, colors, lines & forms while design the new product.
3. Develop skills in understanding various techniques of data collection, brainstorming, Anthropometric & Aesthetic in product design.

### **Course objective:**

1. Establishing industry partnerships that guide, support, and validate PLM research and education activities.
2. Assisting with the integration of PLM .
3. Serving as a knowledge base for the PLM discipline.

### **Course out comes:**

1. Identify the need of PLM
2. Interpret the Product development process.
3. Creat and document the product data.
4. dicuss the advantage of software tools in plm.

## **Automobile Engineering**

### **Course Objectives:**

- i) This course is designed to understand the basic concepts of Automobile and its components.
- ii) To understand the recent advances in the Automobile Technology.

**Course Outcomes:**

1. Students will be able to demonstrate and explain various automobile systems.
2. Students will be able to explain the importance of various important systems like differential, steering, Brakes, Suspensions etc.
3. Students will be able to explain principle of operation, construction and application of latest sensor Technology used in automobiles.

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**Production Planning & Control**

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**Course Objectives:**

1. To introduce the students to the types of productions in the industries as well as they should be familiar with the functions of PPC used in the shop floor of the industry.
2. To introduce the students to the design and development of the product as well as importance of product characteristic for the design and development of product.
3. To familiarize the students with the batch production of the shop floor for optimization for the cost or profit .
4. To introduce the students by using the multi activity chart for calculation of machine cycle efficiency also familiarize with line balancing problems of shop floor.
5. To introduce with calculation of cost of the product as well as replacing the machine after its life time.
- 6 To introduce the students the necessity of maintaining the inventory.

**Course Outcomes:**

Upon successful completion of this course, the student will be able to.....

1. Illustrate the types of production and use of functions of PPC on the shop floor.
2. Illustrate the design and development of the product on the shop floor.
3. Illustrate the optimization technique used in batch production.
4. To calculate the idle time and machine cycle efficiency to improve the productivity.
5. To develop the balanced line of production with minimum idle time.
6. To understand how to maintain the inventory for shop floor.

## **Quality Engineering**

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**Course Objectives:** After learning the subject students will be able to:

- (i) Identify job requirement.
- (ii) Identify job responsibility.
- (iii) Create work culture towards organizational excellence.
- (iv) Develop and strengthen quality view point.

**Course Outcomes:** After studying the subject students will become experts in applying the various tools and able to operate the skill in taking sharp decisions in business.

### **EL-II-Computation Fluid Dynamics**

**Course Objectives:**

1. Equip students with the knowledge base essential for application of computational fluid dynamics to engineering flow problems.
2. Provide the essential numerical background for solving the partial differential Equations governing the fluid flow

**Course Outcomes:** On successful completion of the course, students will be able to:

1. Understand both flow physics and mathematical properties of governing Navier-Stokes equations and define proper boundary conditions for solution.
2. Learn how to formulate and solve computational problems arising in the flow of fluids.

### **EL-III-Cryogenic Engineering**

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**Course Objectives**

1. Learn about low temperature applications in engineering
2. Learn to the technology of gas liquefaction, separation and purification.
3. Study of measurement system at low temperature.
4. Learn to stored Cryogenic fluids.

**Course Outcomes:**

1. Ability to understand various gas liquefaction, gas separation and purification systems.
2. Ability to evaluate the performance of different Cryogenic systems
3. Apply to analyze low temperature systems for various applications.

### **EL-III-Automation & Robotics**

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#### **Objectives**

1. To familiarize the students with the significance of Automation & Robotic system in agile and automated manufacturing processes.
2. To prepare the students to be conversant with robotic elements/ peripherals, their selection and interface with manufacturing equipments.
3. To familiarize the students with the basics of robot kinematics.

#### **Outcomes:** Learner will be able to.

1. Acquire the skills in understanding Automation in Industry & Robot programming Language.
2. Acquire the skill in robot task planning for problem solving.
3. Develop skills in understanding various sensors, robot peripherals and their use.
4. Develop skills in identifying areas in manufacturing, where robotics can be deployed for enhancing productivity.

### **EL-III-Modern Management Techniques**

#### **Objectives**

1. To familiarize the students with the significance of Modern Management Techniques in Manufacturing,
2. To prepare the students to be aware about Kaizen, Just in Time, SMED Poka-Yoke in manufacturing systems.

#### **Outcomes:**

1. Acquire the skills in understanding Modern Management Techniques in Manufacturing,
2. Acquire the skill in FMS & Group Technology and SMED.

### **EL-III – Entrepreneurship Development**

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#### **Course Objective:**

To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

**Course outcomes:** Upon completion of the course, students will be able to gain knowledge and skills needed to run a business successfully.