| 402041: Heating, Ventilation, Air Conditioning and Refrigeration | | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Credits** | | **Examination Scheme** | |
| **Theory** | **3 Hrs./Week** | **Theory** | **3** | **In-Semester** | **30 Marks** |
| **Practical** | **2 Hrs./Week** | **Practical** | **1** | **End-Semester** | **70 Marks** |
| | | | | **Oral** | **25 Marks** |

**Course Outcomes:**

On completion of the course the learner will be able to;

CO1.**ANALYSE** different air-craft refrigeration systems and **EXPLAIN** the properties, applications and environmental issues of different refrigerants.

CO2.**ANALYSE** multi pressure refrigeration system used for refrigeration applications.

CO3.**DISCUSS** types of compressors, condensers, evaporators and expansion valves along with regulatory and safety controls and **DESCRIBE** Transcritical and ejector refrigeration systems.

CO4.**ESTIMATE** cooling load for air conditioning systems used with concern of design conditions and indoor quality of air.

CO5.**DESIGN** air distribution system along with consideration of ventilation and infiltration.

CO6.**EXPLAIN** the working of types of desiccants, evaporative, thermal storage, radiant cooling, clean room and heat pump systems.

| 402042: Dynamics of Machinery | | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Credits** | | **Examination Scheme** | |
| **Theory** | **3 Hrs./Week** | **Theory** | **3** | **In-Semester** | **30 Marks** |
| **Practical** | **2 Hrs./Week** | **Practical** | **1** | **End-Semester** | **70 Marks** |
| | | | | **Oral** | **25 Marks** |

**Course Outcomes:**

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

CO1. **APPLY** balancing technique for static and dynamic balancing of multi cylinder inline and radial engines.

CO2. **ANALYZE** the gyroscopic couple or effect for stabilization of Ship, Airplane and Four wheeler vehicles.

CO3. **ESTIMATE** natural frequency for single DOF un-damped & damped free vibratory systems.

CO4. **DETERMINE** response to forced vibrations due to harmonic excitation, base excitation and excitation due to unbalance forces.

CO5. **ESTIMATE** natural frequencies, mode shapes for 2 DOF un-damped free longitudinal and torsional vibratory systems.

CO6. **DESCRIBE** noise and vibration measuring instruments for industrial / real life applications along with suitable method for noise and vibration control.

| 402043: Turbomachinery | | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Credits** | | **Examination Scheme** | |
| **Theory** | **2 Hrs./week** | **Theory** | **2** | **In-Semester** | **-** |
| **Practical** | **2 Hrs./week** | **Term Work** | **1** | **End-Semester*** | **50 marks** |
| | | | | **Term Work** | **25 marks** |
| **End semester examination shall be of 2 hrs.** | | | | **Oral** | **25 marks** |

**Course Outcomes:**

On completion of the course the learner will be able to;

CO1: **VALIDATE** impulse moment principle using flat, inclined and curved surfaces and **INVESTIGATE** performance characteristics of hydraulic turbines.

CO2: **DETERMINE** performance parameters of impulse and reaction steam turbine along with discussion of nozzles, governing mechanism & losses.

CO3: **MEASURE** performance parameters of single & multistage centrifugal pumps along with discussion of cavitation and selection.

CO4: **EXPLAIN** performance parameters of centrifugal compressor along with discussion of theoretical aspects of axial compressor.

| 402044D: Industrial Engineering | | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Credits** | | **Examination Scheme** | |
| **Theory** | **3 Hrs./Week** | **Theory** | **3** | **In-Semester** | **30 Marks** |
| **Tutorial** | | **Tutorial** | | **End-Semester** | **70 Marks** |

**Course Outcomes**

Learner will be able to:

CO1. **EVALUATE** the productivity and **IMPLEMENT** various productivity improvement techniques.

CO2. **APPLY** work study techniques and **UNDERSTANDS** its importance for better productivity.

CO3. **DEMONSTRATE** the ability to **SELECT** plant location, appropriate layout and material handling equipment.

CO4. **USE** of Production planning and control tools for effective planning, scheduling and managing the shop floor control.

CO5. **PLAN** inventory requirements and **EXERCISE** effective control on manufacturing requirements.

CO6. **APPLY** Ergonomics and legislations for human comfort at work place and **UNDERSTANDS** the role of value engineering in improving productivity.

| 402045A: Product Design and Development | | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Credits** | | **Examination Scheme** | |
| **Theory** | **3 Hrs./Week** | **Theory** | **3** | **In-Semester** | **30 Marks** |
| | | | | **End-Semester** | **70 Marks** |

**Course Outcomes:**

On completion of the course the learner will be able to;

CO1. **UNDERSTAND** Product design and Product development processes

CO2. **UNDERSTAND** Processes, tools and techniques for Market Survey & Product Specification Finalization

CO3. **UNDERSTAND** Processes, tools and techniques for Concept Inception, Verification and selection

CO4. **UNDERSTAND** Processes, tools and techniques for Concept Exploration & Development

CO5. **UNDERSTAND** Processes, tools and techniques for Design Verification and Validation

CO6. **UNDERSTAND** Processes, tools and techniques for Robust Design and Development

| 402046: Data Analytics Laboratory | | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Credits** | | **Examination Scheme** | |
| **Practical** | **2 Hrs.** | **Practical** | **1** | **Term Work** | **50** |

**Course Outcomes:**

On completion of the course, the learner will be able to

CO1:**UNDERSTAND** the basics of data analytics using concepts of statistics and probability.

CO2:**APPLY** various inferential statistical analysis techniques to describe data sets and withdraw useful conclusions from acquired data set.

CO3:**EXPLORE** the data analytics techniques using various tools

CO4:**APPLY** data science concept and methods to solve problems in real world context

CO5:**SELECT** advanced techniques to conduct thorough and insightful analysis and interpret the results

| 402047: Project (Stage I) | | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Credits** | | **Examination Scheme** | |
| **Practical** | **4 Hrs./Week** | **Practical** | **2** | **Term Work** | **50 Marks** |
| | | | | **Oral** | **50 Marks** |

**Course Outcomes:**

On completion of the course the learner will be able to;

CO1. **IMPLEMENT** systems approach.

CO2. **CONCEPTUALIZE** a novel idea / technique into a product.

CO3. **THINK** in terms of a multi-disciplinary environment.

CO4. **TAKE ON** the challenges of teamwork, and **DOCUMENT** all aspects of design work.

CO5. **UNDERSTAND** the management techniques of implementing a project.

CO6. **DEMONSTRATE** the final product for Functionality, Designability, and Manufacturability.

| 402048: Computer Integrated Manufacturing | | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Credits** | | **Examination Scheme** | |
| **Theory** | **3 Hrs./Week** | **Theory** | **3** | **In-Semester** | **30 Marks** |
| **Practical** | **2 Hrs./Week** | **Practical** | **1** | **End-Semester** | **70 Marks** |
| | | | | **Term Work** | **25 Marks** |
| | | | | **Oral** | **25 Marks** |

**Course Outcomes:**

On completion of the course the learner will be able to;

CO1. **EXPLAIN** CIM and factory automation.

CO2. **UNDERSTAND** the integration of hardware and software elements for CIM

CO3. **APPLY** CNC program for appropriate manufacturing techniques.

CO4. **ANALYZE** processes planning, quality and MRP integrated with computers.

CO5. **INTERPRET** flexible, cellular manufacturing and group technology.

CO6. **ANALYZE** the effect of IOT, Industry-4.0 and cloud base manufacturing.

| 402049: Energy Engineering | | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Credits** | | **Examination Scheme** | |
| **Theory** | **3 Hrs./Week** | **Theory** | **3** | **In-Semester** | **30 Marks** |
| **Practical** | **2 Hrs./Week** | **Practical** | **1** | **End-Semester** | **70 Marks** |
| | | | | **Term Work** | **25 Marks** |
| | | | | **Oral** | **25 Marks** |

**Course Outcomes:**

On completion of the course the learner will be able to;

CO1:**EXPLAIN** the power generation scenario, the layout components of thermal power plant and **ANALYZE** the improved Rankine cycle.

CO2:**ANALYZE** the performance of steam condensers, cooling tower system; RECOGNIZE an environmental impact of energy systems and methods to control the same.

CO3:**EXPLAIN** the layout, component details of diesel engine plant, hydel and nuclear energy systems.

CO4:**ANALYZE** gas and improved power cycles.

CO5:**EXPLAIN** the fundamentals of renewable energy systems.

CO6:**EXPLAIN** basic principles of energy management, storage and economics of power generation.

| 402050B: Energy Audit and Management | | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Credits** | | **Examination Scheme** | |
| **Theory** | **3 Hrs./Week** | **Theory** | **3** | **In-Semester** | **30** |
| | | | | **End-Semester** | **70** |

**Course Outcomes:**

On completion of the course the learner will be able to;

CO1. **EXPLAIN** the energy need and role of energy management
CO2. **CARRY OUT** an energy audit of the Institute/Industry/Organization
CO3. **ASSESS** the ENCON opportunities using energy economics
CO4. **ANALYSE** the energy conservation performance of Thermal Utilities
CO5. **ANALYSE** the energy conservation performance of Electrical Utilities
CO6. **EXPLAIN** the energy performance improvement by Cogeneration and WHR method

| 402051D: Industrial Psychology and Organizational Behavior | | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Credits** | | **Examination Scheme** | |
| **Theory** | **3 Hrs./Week** | **Theory** | **3** | **In-Semester** | **30 Marks** |
| | | | | **End-Semester** | **70 Marks** |

**Course Outcomes**

On completion of the course the learner will be able to;

CO1. **DEMONSTRATE** fundamental knowledge about need and scope of industrial - organizational psychology and behavior.
CO2. **ANALYZE** the job requirement, have understanding of fatigue, boredom and improve the job satisfaction.
CO3. **UNDERSTAND** the approaches to enhance the performance.
CO4. **KNOWLEDGE** of theories of organizational behavior, learning and social-system.
CO5. **UNDERSTAND** the mechanism of group behavior, various aspects of team, leadership and conflict management.
CO6. **EVALUATE** the organizational culture, manage the change and understands organizational development approaches.

| 402052: Mechanical Systems Analysis Laboratory | | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Credits** | | **Examination Scheme** | |
| **Practical** | **02 Hrs.** | **Practical** | **01** | **Term Work** | **25 Marks** |
| | | | | **Oral** | **25 Marks** |

**Course Outcomes:**

On completion of the course the learner will be able to;

CO1. **DEVELOP** an understanding of the Systems Engineering Process and the range of factors that influence the product need, problem-specific information collection, Problem Definition, Task Specification, Solution Concept inception, Concept Development, System's Mathematical Modelling, Synthesis, Analysis, final solution Selection, Simulation, Detailed Design, Construction, Prototyping, Testing, fault-finding, Diagnosis, Performance Analysis, and Evaluation, Maintenance, Modification, Validation, Planning, Production, Evaluation and use of a system using manual calculation, computational tools to automate product development process, redesign from customer feedback and control of technological systems.

CO2. **ILLUSTRATE** the concepts and USE the developed skill-set of use of computational tools (FEA, CFD, MBD, FSI, CAE) to automate the complete product development process.

CO3. **EVALUATE** the knowledge of new developments and innovations in technological systems to carry forward to next stage of employment after passing your Undergraduate Degree Examination.

CO4. **APPRAISE** how technologies have transformed people's lives and can be used to **SOLVE** challenges associated with climate change, efficient energy use, security, health, education and transport, which will be coming your ways in the coming future.

CO5. **PRIORITIZE** the concept of quality and standards, including systems reliability, safety and fitness for the intended purpose.

CO6. **INVENT** yourself to face the challenges of future technologies and their associated Problems.

| 402053: Project (Stage II) | | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Credits** | | **Examination Scheme** | |
| **Practical** | **10 Hrs./Week** | **Practical** | **5** | **Term Work** | **100 Marks** |
| | | | | **Oral** | **50 Marks** |

**Course Outcomes:**

On completion of the course the learner will be able to;

CO1. **IMPLEMENT** systems approach.

CO2. **CONCEPTUALIZE** a novel idea / technique into a product.

CO3. **THINK** in terms of a multi-disciplinary environment.

CO4. **TAKE ON** the challenges of teamwork, and **DOCUMENT** all aspects of design work.

CO5. **UNDERSTAND** the management techniques of implementing a project.

CO6. **DEMONSTRATE** the final product for Functionality, Designability, and Manufacturability.