

Beyond Curricula

Curriculum structure of Development of life skills and Professional practice

Year: 1st, Semester: I & II

Teaching Scheme: Practical: 2 hrs. / week for all departments

Credit: Zero

Aim:

- Conduct different session to improve students' memory Power
- Conduct different session to improve time management skills
- Developing the team work culture
- Personality development and problem solving ability

Objectives:

- Use techniques of acquisition of information from various sources
- Developing English speaking, writing and reading skills
- Apply the techniques of enhancing the memory power.
- Develop assertive skills.
- Apply techniques of effective time management.
- Set the goal for personal development
- Enhance creativity skills.
- Develop good habits to overcome stress.
- Face problems with confidence
- Apply problem solving skills for a given situation
- Survive self in today's competitive world

Pre-requisite:

1. Basic of self analysis method
2. Basic knowledge of stress and time management concepts
3. Basic knowledge of presentation skills
4. Desire to gain comparable knowledge and skills of various activities in various streams of engineering

Semester: I

Contents:

Unit 1: Communication as a Skill for career building

- Prepare for career
- Presentation skills
- Business/Professional communication
- Telephone skills in professional sectors
- Soft skills development

Unit II: Techniques for leading group discussion

- What's the point of group discussion?
- Why would you specifically lead a group discussion?
- How do you lead a group discussion?

Unit III: Fun-Team building activities for improving communication

- Team building activities
- Tips on improving communication skills in team
- Practice in team work to get positive feedback

Semester: II

Contents:

Unit 1: Importance of Development of life skills:

- Importance of Development of life skills, Introduction to subject,
- Importance in present context and application of life skill in personal and professional life.

Unit II: Information search:

- Information source –primary, secondary, tertiary print and non – print, documentary, electronic information center, library, exhibition, government departments.
- Internet information search – process of searching, collection of data –questionnaire, taking Interview, observation method.
- Information analysis and processing.

Unit III: Self analysis:

- Understanding self—Attitude, aptitude, assertiveness, self esteem, confidence buildings.
- SWOT analysis – concept, how to make use of SWOT concept of motivation.

Unit IV: Self development

- Stress management –concept, causes, effects and remedies to avoid / minimize stress.
- Health management – importance, dietary guidelines and exercises.
- Time management- importance, process of time planning, urgent vs importance, factors leading to time loss and ways to handle it, tips for effective time management.
- Emotion- concept, types, controlling, emotional intelligence.
- Creativity concept, factors enhancing creativity. Thinking – analytical & logical thinking, higher order thinking
- Goal setting – concept, setting smart goal.

Unit V: Study habits:

- Ways to enhance memory and concentration.
- Developing reading skill.
- Organization of knowledge, Model and methods of learning.

Text Books:

Name of Authors	Title of the Book	Name of the Publisher
Personality Development & Soft Skills	B. K. Mitra	Oxford University Press

E.H. Mc Grath , S.J.	Basic Managerial Skills for All	Prentice Hall of India, Pvt Ltd
Allen Pease	Body Language	Sudha Publications Pvt. Ltd.
Lowe and Phil	Creativity and problem solving	Kogan Page (I) P Ltd
Adair, J	Decision making & Problem Solving	Orient Longman
Bishop , Sue	Develop Your Assertiveness	Kogan Page India
Marion E	Make Every Minute Count	Kogan page India
Pearson Education Asia	Organizational Behavior	Tata McGraw Hill
Richard Hale, Peter Whilom	Target setting and Goal Achievement	Kogan page India
Chakravarty, Ajanta	Time management	Rupa and Company
Marshall Cooks	Adams Time management	Viva Books

Reference Books:

Name of Authors	Title of the Book	Name of the Publisher
Darlene Mannix	Life Skills Activities for Secondary Students with Special Needs	Kindle Edition

Beyond Curriculum Structure of Electrical Engineering Department

Year: 2nd & 3rd Year: 3th, 4th, 5th, 6th Semester

Teaching Scheme: Theory: 2hrs./Week for all departments

Credit: zero

Aim:

- Complements academic learning
- Fosters skill development
- Offers experiential learning
- Encourages diverse perspectives

Objectives:

- Foster personal growth
- Develop diverse skills
- Encourage creativity
- Promote critical thinking
- Enhance problem-solving abilities
- Cultivate leadership qualities
- Improve communication skills
- Build teamwork capabilities
- Reinforce academic learning
- Provide practical application of knowledge
- Offer hands-on experiences
- Expose students to diverse perspectives

Pre-requisite:

- Willingness to explore
- Time management skills
- Open-mindedness
- Positive attitude
- Availability of resources

Contents:

3rd Semester:

Unit 1: Machine design:

- **Problem Definition:** The first step in machine design is clearly defining the problem or need that the machine is intended to address. This involves understanding the requirements, constraints, performance objectives, and operating conditions of the machine.
- **Conceptual Design:** Once the problem is defined, engineers brainstorm and develop conceptual designs for the machine. This stage involves generating ideas, exploring different approaches, and evaluating the feasibility of various design concepts.
- **Preliminary Analysis:** Engineers conduct preliminary analysis and calculations to assess the performance, strength, stability, and other critical characteristics of the proposed design concepts. This analysis helps identify potential design challenges and informs decision-making during the design process.
- **Detailed Design:** After selecting a promising conceptual design, engineers proceed to the detailed design phase. This involves creating detailed drawings, specifications, and models of the machine components, subsystems, and assemblies. Computer-aided design (CAD) software is commonly used to develop detailed designs.

Unit 2: Database management system:

- **Data Definition Language (DDL):** DDL is used to define the structure and schema of the database, including tables, fields, data types, constraints, indexes, and relationships. Examples of DDL commands include CREATE, ALTER, and DROP.
- **Data Manipulation Language (DML):** DML is used to perform operations on the data stored in the database. Common DML commands include SELECT (for querying data), INSERT (for adding new records), UPDATE (for modifying existing records), and DELETE (for removing records).
- **Data Query Language (DQL):** DQL is a subset of DML used specifically for querying data from the database. The most commonly used DQL command is SELECT, which retrieves data based on specified criteria.
- **Data Control Language (DCL):** DCL is used to control access to the database and enforce security policies. DCL commands include GRANT (to grant permissions) and REVOKE (to revoke permissions) on database objects.

4th Semester:

Unit 1: Search Engine optimisation:

- **Technical SEO:** Ensure that your website is technically optimized for search engines. This involves improving website speed, implementing schema markup, optimizing site structure and navigation, fixing broken links, and making the website mobile-friendly.
- **User Experience (UX):** Provide a seamless and intuitive user experience on your website. Factors such as page load speed, mobile responsiveness, easy navigation, and clear calls-to-action contribute to better user experience, which can indirectly improve your search rankings.
- **Local SEO:** If your business serves a local audience, optimize your website for local search. This includes creating a Google My Business profile, optimizing for local keywords, obtaining local citations, and encouraging customer reviews.
- **Analytics and Monitoring:** Use tools like Google Analytics and Google Search Console to track website performance, monitor keyword rankings, and identify areas for improvement. Regularly analyse data to make informed decisions and adjust your SEO strategy accordingly.

Unit 2: Enterprise resource planning:

- **Centralized Database:** All data related to different business processes are stored in a single, centralized database, ensuring data consistency and accuracy.
- **Integration:** ERP systems integrate various business functions and processes, eliminating data silos and enabling seamless communication between different departments.
- **Automation:** ERP systems automate repetitive tasks and processes, reducing the need for manual intervention and improving productivity.
- **Reporting and Analytics:** ERP systems provide robust reporting and analytics capabilities, allowing organizations to gain insights into their operations and make data-driven decisions.

5th Semester:

Unit 1:Need of Digital Library in Colleges:

- **Access to Information:** Digital libraries provide students and faculty with easy access to a vast array of resources, including academic journals, e-books, research papers, and multimedia materials. This access enhances learning and research opportunities, regardless of physical location or time constraints.
- **Cost-Effectiveness:** Compared to traditional print libraries, digital libraries can often be more cost-effective to maintain. They eliminate the need for physical storage space and reduce expenses associated with purchasing, cataloguing, and preserving print materials.
- **Enhanced Searched and Organization:** Digital libraries typically offer advanced search capabilities and organization features, such as metadata tagging and keyword indexing. These tools make it easier for users to find relevant resources quickly and efficiently.
- **Remote Learning Support:** With the increasing popularity of online and distance education, digital libraries play a crucial role in supporting remote learning initiatives. They provide remote students with the same access to resources as on-campus students, fostering equity and inclusivity in education.

Unit 2:Ethics in Engineering:

- **Safety:** Engineers have a responsibility to prioritize the safety and well-being of the public, as well as the environment, in all aspects of their work. This includes considering potential risks and hazards associated with their designs and implementing appropriate safeguards.
- **Honest and Integrity:** Engineers should maintain honesty and integrity in their professional conduct, including accurately representing their qualifications, disclosing conflicts of interest, and providing truthful information to clients and stakeholders.
- **Professional Competence:** Engineers are expected to possess and maintain the necessary knowledge, skills, and expertise to perform their duties competently. This includes staying up-to-date with advancements in their field and seeking additional training or education when needed.
- **Sustainability:** Engineers should consider the long-term environmental impact of their projects and strive to develop sustainable solutions that minimize resource consumption, pollution, and ecological damage.

6th Semester:

Unit 1: Firefighting in common place:

- **Life Safety:** The primary objective of firefighting in common places is to protect human life. In the event of a fire, prompt response and effective firefighting efforts can prevent injuries and save lives by facilitating timely evacuation and suppressing the spread of flames and smoke.
- **Property Protection:** Fires can result in extensive damage to buildings, belongings, and infrastructure. Firefighting activities aim to contain the fire, prevent it from spreading to adjacent areas, and minimize property damage, thereby preserving valuable assets and reducing financial losses.
- **Community Well-being:** Common places often serve as hubs for social interaction, education, commerce, and recreation. Fire safety measures contribute to the overall well-being of communities by ensuring that these spaces remain safe and accessible for residents, employees, students, and visitors.
- **Economic Stability:** Fire incidents can have significant economic repercussions, including repair costs, business interruptions, and insurance liabilities. By investing in fire prevention, detection, and suppression systems, common places can safeguard their economic viability and minimize the financial impact of fires.

Unit 2: Basic of Simulation (Electrical):

- **Purpose of Simulation:** The primary purpose of simulating electrical systems is to analyse their behaviour under various conditions without the need for physical prototypes. Simulations help engineers understand how the system will perform, identify potential issues, and optimize its design.
- **Modelling Components:** Simulating electrical systems involves creating mathematical models of individual components and their interconnections. These models capture the electrical characteristics, behaviour, and relationships between components within the system. Models can range from simple lumped-parameter models to complex, distributed-parameter models.
- **Simulation Tools:** Various software tools and platforms are available for simulating electrical systems, each tailored to specific applications and requirements. These tools provide graphical interfaces for designing circuits, specifying component parameters, running simulations, and analysing results. Some popular simulation software includes LTspice, MATLAB/Simulink, ANSYS, COMSOL Multiphysics, and PSCAD.
- **Analysis and Optimization:** Once a simulation is complete, engineers analyse the results to evaluate the performance of the electrical system under different conditions. This analysis may involve examining voltage and current waveforms, power dissipation, efficiency, stability, and other relevant parameters. Based on the findings, engineers can iteratively optimize the design to meet desired specifications and performance criteria.

Beyond Curriculum Structure of Civil Engineering Department

Year 2nd Semester 3rd and 4th

[Teaching Scheme: Theory 2 hrs/Week Credit: Zero]

Aim:

1. Developing the surveying skill required for civil engineering.
2. -Developing the conceptual knowledge in building construction.
3. Study of geo-technical virtue of the surroundings required for building construction.
4. Development of conceptual knowledge in transportation engineering

Objectives:

1. Measure the area of land.
2. Identify & suggest rectification the various defects in civil engineering works.
3. Describe different types of concrete.
4. Describe working of the velocity measuring devices.
5. Apply principles of surveying and leveling for Civil Engineering works.
6. Classify different irrigation systems.
7. Prepare specification of an item of construction.
8. Organize, supervise and co-ordinate construction activities of road.

Prerequisite:

1. Student should be perfect in drawing and sketching.
2. Student should be able to think over the construction problems and their remedies.
3. Student should be conversant with the basics of Mechanics of Structure and Fluid Mechanics.
4. Student should have the knowledge and modes of transportation.

3rd Semester

Unit-1: Measurement of horizontal distance:

- a. Introduction of measurement of horizontal distance.
- b. Methods of measuring horizontal distance – pacing, odometer reading, tacheometry, electronic distance measurement, chaining and taping.

Unit-2: Building maintenance:

- a. Cracks - causes and types of cracks, identification and repair of cracks, guniting and grouting, use of epoxy and crack fills, remedial measures
- b. Settlement - causes and remedial measures; Plinth protection – necessity and materials used.
- c. Demolition - Necessity, method of demolition-hand demolition, machine demolition, Controlled blasting demolition, precautions during demolition.
- d. Rebaring techniques - Necessity and equipment for rebaring techniques.

Unit-3: Properties of Special Concrete:

Advantages & Limitations of the following types of Special concrete:-

- i) Steel-fibre reinforced Concrete, ii) Prestressed Concrete iii) Precast Concrete
- iv) High strength concrete v) Polymer concrete

Unit-4: Strain Energy:

- a. Types of loading – gradual, suddenly applied load & Impact load
- b. Definition of strain energy, modulus of resilience and proof resilience.
- c. Comparison of stresses due to gradual load, sudden load and impact load.

4th Semester

Unit:1 Flow Measuring Devices:

- a. Venturimeter – Component parts, principle of working, Study and use of venturi meter.
- b. Flow through orifice Orifice- Definition and use, Types of orifice - based on various criteria.
- c. Coefficient of contraction, coefficient of velocity and coefficient of discharge, Relationship between them. Discharge through small sharp-edged circular orifice and large orifice (discharging free condition),
- d. Determination of hydraulic coefficient of orifice, Orificemeter – component parts, working principles, study and use of orificemeter, Numerical.

Unit:2 Construction Surveying :

- a. Introduction, requirements of setting out, horizontal and vertical control
- b. Setting out a pipe line
- c. Setting out of building and structure
- d. Staking out a highway

Unit: 3 Structure of Soil Particles:

- a. Introduction to soil structure – a. soil particle structure – tetrahedral unit and octahedral unit, Kaolinite mineral, halloysite mineral, montmorillonite, illite b.soil mass structure – single grained, flocculent and honey-combed structure
- b. Clay particle-water relationship

Year: 3rd - Semester: 5th and 6th

[Teaching Scheme: Theory 2 hrs/Week - Credit: Zero]

5th Semester

Unit:1 Estimate of other structure

- a. Estimate of a single span slab culvert/pipe culvert .
- b. Estimate of a man-hole.
- c. Estimate of simple fink type roof truss.

Unit:2: Watershed Management Introduction:

- a. Definition of watershed, definition of watershed management, need for watershed management.
- b. Soil conservation, need of Soil conservation, Water Harvesting-Definition, need of rainwater harvesting, techniques of rainwater harvesting.

Unit:3 Water logging and Land Drainage:

- a. Introduction – ill effects of water logging, causes of water logging, factors responsible for water logging.
- b. Anti-water-logging measures – preventive measure – names of the different measures with short description; curative measures – names of the different measures with short description.

Unit:4 Traffic Engineering:

- a. Traffic volume study
- b. Traffic control devices- road signs, marking, Signals, Traffic island.
- c. Highway intersection – a. at grade intersections (non channelized, channelized intersection and traffic rotaries) and b. grade separated or fly over intersections and interchange
- d. Road accident. Building code IS:1904

6th Semester

Unit: 1 Specifications of building:

- a. Necessity and importance of specifications of an items, points to be observed in framing specifications of an item, types of specification –brief and detailed, standard and manufacturers specification.
- b. Preparing detailed specifications of items in civil engineering works. Standard specification book
- c. Legal Aspects Of Specification.

Unit: 2 Hill Roads:

- a. Parts and functions of hill road components, types of curves, Hill road formation.
- b. Land slides- causes and prevention.
- c. Structures- drainage structures.

Unit: 3 Disaster Management:

Preparedness, Response, Recovery – Arrangements to be made in the industries / factories and buildings – Mobilization of Emergency Services - Search and Rescue operations – First Aids – Transportation of affected people – Hospital facilities – Fire fighting arrangements – Communication systems – Restoration of Power supply – Getting assistance of neighbors / Other organizations in Recovery and Rebuilding works – Financial commitments – Compensations to be paid – Insurances – Rehabilitation.

Unit: 5 Environmental Sanitation:

- a. Rural Sanitation Necessity and importance, Rural sanitation- Types of Privies – Aqua privy and Bore Hole Latrine- construction and working, Composting
 - b. Environmental impact assessment (EIA) - methodology of EIA – organizing the job - performing the assessment - preparation of environmental impact statement (EIS) - review of EIS - environmental risk assessment – limitation of EIA.
-

Beyond Curriculum Structure of Electronics and Telecommunication Engineering Department

Year 2ndSemester 3rd and 4th

[Teaching Scheme: Theory 2 hrs/Week Credit: Zero]

Aim:

1. Developing the problem solving skill required for Electronics and Telecommunication Engineering.
2. Developing the conceptual knowledge in circuit operation.
3. Study of mobile communication by virtue of the surroundings required for mobile network construction.
4. Development of conceptual knowledge in GPS communication.

Objectives:

The student will be able to -

1. Do conversion of different codes
2. Understand the operation of BJT
3. Represent the signals in the mathematical form from the graphical form
4. Check the stability of a system using Nyquist Plot
5. Analyze Tuned Circuit concept.
6. Understand Magnetic recording technology.
7. Represent Current Trends in Processor Architecture.
8. Understand the application of LRC and VRC code for data communication.

Pre- Requisite:

1. Basic Knowledge of Number System
2. Basic Knowledge of basic electronic circuitry component operation.
3. Basic understanding of linear function (mathematical)
4. Basic idea of data communication

Year: 2nd - Semester: 3rd and 4th

3rd Semester

Unit-1: Data representation in digital form:

Introduction of Digital Data representation using different codes. (Number System - Introduction to Binary, Octal, Decimal, Hexadecimal number system, Conversion of number systems),

Unit-2: Brief introduction on Tuned Circuit:

Idea of resonance – series and parallel resonant circuits – Q-value, selectivity, bandwidth. Principle of coupling – self-inductance & mutual inductance and their relationship – Co-efficient of coupling. Analysis of single tuned and double tuned circuits

4th Semester

Unit-1: Basic Bipolar Junction Transistor Circuit Analysis:

Bipolar Transistor

Formation and properties of PNP and NPN Transistor. Transistor configurations, input and output characteristics. α , β , and γ factors. Comparison of CB, CE, and CC configurations.

Unit:2To discuss the magnetic recording technology:

Basic principles of Magnetic Recording, Playback. . Basic principles of digital recording & block diagram of MP3 player & Explanation.

Year: 3rd - Semester: 5th and 6th

[Teaching Scheme: Theory 2 hrs/Week - Credit: Zero]

5th Semester

Unit:1 Graphical to Mathematical representation of different periodic signals and its application to mobile technology.

Discuss Signals, Systems & Signal processing. Explain basic element of a digital signal processing system. Compare the advantages of digital signal processing over analog signal processing.

Unit:2: Current Trends in Processor Architecture:

PLD (Programmable Logic Device), Draw the block diagram showing the major components of PLC and state each function of each Component, Explain the basic operation of PLC, Describe briefly PLC programming.

6th Semester

Unit: 1 Introduction to Nyquist Plot:

Mathematical modeling of: electrical systems, mechanical systems, electro-mechanical systems.

Unit: 2 Application of LRC and VRC code for data communication:

The advantage of using VRC is that it can check all single bit errors but can check odd parity only in the case of change of odd bits. The advantage of using LRC over VRC is that it can check all the burst errors.

Beyond Curriculum Structure of Computer Science and Technology Department

Year 2nd Semester 3rd and 4th

[Teaching Scheme: Practical 2 hrs/Week Credit: Zero]

Aim:

- The course will have a practical focus, with significant in-class programming, programming assignments and a large project .
- The course philosophy is that programming is learned by doing. While the course focuses on Android, general principles of software engineering and mobile app development.
- Teach general principles of software engineering and mobile app development..
- Building tools for analysis Generative systems

Objectives:

- Understand and explain the concepts, opportunities and challenges of digital transformation using IoT.
- Design and model IoT solutions using simulation tools (Packet Tracer).
- Design and prototype IoT solutions using electronics, microcontrollers (Arduino) and single board computers (Raspberry Pi).
- Use Python to Collect, Transform, analyze, and visualize data from the sensor and store them in SQL data bases.
- Conduct exploratory data analysis activities.
- Apply basic Machine Learning algorithms to extract insights from data.
- Present and communicate using data storytelling.
- Describe the evolution of data management technologies from SQL to NoSQL.
- Explain the fundamental principles of a modern data center and of a distributed scalable Big Data platform like Apache Hadoop.
- Securely connect the prototype to the Internet.
- Use Python to program the behavior of the IoT devices and to connect them to cloud services via APIs.
- Work as a team and apply the User Centered Design Approach (“design thinking”) to develop,

Prerequisite:

5. Student should be well versed with Programming Languages such as C ,Python and Java
6. Student should be able to think over the given problem and develop solution in varied domains.
7. Student should be conversant with the basics of Data Structure, C Programming, Python Programming and AI.
8. Student should have the knowledge and modes of network communication and IoT too.

3rd Semester**Unit-1: Unit 1 : Introduction to Social Media Data**

- Describe the different types of data commonly found on social platforms.
- Understand the ethical sensitivities in obtaining and operating on social data.
- Understand the structure of those data.

Unit 2: Visualizing and Modeling Patterns in Social Media Data

- Load a large social media corpus.
- Visualize corpus along geographic and temporal axes.

Unit 3: Social Media Networks

- Articulate how networks act as the substrate for modern social media platforms
- Describe how and why different networks exist within the same data
- Construct different varieties of networks from a social dataset
- Compute a variety of network measures from a social media dataset

c. Comparison of stresses due to gradual load, sudden load and impact load.

4th Semester**Unit 1: Intro to Offensive Security:**

- ✓ What is Offensive Security
- ✓ Difference between Offensive and Defensive Security
- ✓ Application of Offensive security in a dummy model
- ✓ Demo of Ethical Penetration Testing

Unit 2: Intro to Defensive Security:

- ✓ Preventing intrusions
- ✓ Detecting and responding to intrusions
- ✓ User Cyber Security Awareness

5th Semester

Unit 1 INTRODUCTION:

- Introduction to IoT
- IoT in Home
- IoT in Office

- **Unit 2: Cisco Packet Tracer**
- Cisco Packet Traer Overview
- Cisco Packet Tacer modes
- Cisco Packet tracer modules

- **Unit 3: Smart Home Implementation**
- Smart Home Elements
- Modes in IoT required
- Algorithm and Flowchart
- Device Configuration
- Result of Implementation

6th Semester

Unit 1: Overview of Machine Learning:

- ✓ Extract Features
- ✓ Build a Model
- ✓ Evaluate the Model
- ✓ Review

Unit 2: Import and Preprocess Data:

- ✓ Organization of Data Files
- ✓ Create a Datastore
- ✓ Add a Preprocessing Function

Unit 3: Classification Models :

- ✓ Training and Testing Data
- ✓ Machine Learning Models
- ✓ Training a Model
- ✓ Make Predictions
- ✓ Investigate Misclassifications
- ✓ Improve the Model

Unit 4 :Linux Fundamentals:

- ✓ Overview of all basic commands
- ✓ File System hierarchy
- ✓ Grep
- ✓ Vim editor modes

Unit 5: AWS- An overview:

- ✓ Features of AWS
 - ✓ Features of Amazon Database Services
 - ✓ Features of Amazon Marketplace
-

Beyond Curriculum Structure of Mechanical Engineering

YEAR – 2ND & 3RD YEAR (3RD 4TH 5TH 6TH)

TEACHING SCHEME: THEORY: 2HRS / WEEK CREDIT POINTS – ZERO

Aim .

1. To understand & analyze various types of subjects along with main causes of failure of machine parts.
2. To study the effect of combined stress on different machine parts.
3. To understand principles of machine design
4. personality development and problem solving ability
5. To understand the concept of energy, work, heat & their conversion.
6. To understand the concept of thermodynamics and study of various thermodynamic laws with their applications.
7. To study the properties of gas & properties of steam and their application in different thermodynamic system.
8. To study the basics of Heat transfer and its application.

Objective

1. Understand & analyze the basic principles involved in the behaviour of machine parts under load in the context of designing it.
2. Calculate strain energy for spring and axially loaded members
3. Estimate principal stresses and maximum shear stress for a given combined loading by analytical & Mohr's circle method.
4. Know various sources of energy & their applications.
5. . Apply fundamental concepts of thermodynamics to thermodynamic systems.
6. Understand various laws of thermodynamics.
7. Apply various gas laws & ideal gas processes to various thermodynamic systems.

Pre-Requisite:-

1. Elementary knowledge on Physics and basic Mathematics
2. Elementary knowledge on engineering mechanics
3. Differential and integral calculus
4. Elementary knowledge on strength of materials
5. Depending on the educational background of the student, the previous knowledge is examined in order to determine if any supplementary examination in relevant subjects may be necessary

CONTENT

3RD SEMESTER

Unit-1: ADVANCED STRENGTH OF MATERIAL

1. Principal Planes & Principal Stresses
2. Definition of principal plane & principal stresses.
3. Expression for normal and tangential stress, maximum shear stress.
4. Stresses on inclined planes.
5. Position of principal planes & planes of maximum shear.
6. Graphical solution using Mohr's circle of Stresses

Unit-2: ADVANCE CASTING TECHNICES

1. Investment Casting (Lost-Wax Casting)
2. Shell Mold Casting
3. Vacuum Casting:

4TH SEMESTER

Unit - 1: RENEWAL ENERGY SYSTEM

Solar Energy: Solar energy is the radiant energy emitted by the Sun. Photovoltaic (PV) systems convert sunlight into electricity, while solar thermal systems use sunlight to heat water or air.

Wind Energy: Wind energy uses wind turbines to convert the kinetic energy of wind into electricity.

Hydropower: Hydropower uses the energy of moving water to generate electricity. Hydroelectric dams use turbines to convert the potential energy of falling water into electricity.

UNIT -2 SURFACE METROLOGY

Surface Measurement Techniques: There are a variety of techniques used to measure surface texture, each with its own advantages and limitations. Some common techniques include:

Contact Stylus Profilometry: This technique uses a physical stylus to trace the surface profile. It is a versatile technique that can provide high-resolution measurements.

Non-Contact Optical Profilometry: This technique uses light to measure the surface profile. It is a non-destructive technique that can be used to measure rough or delicate surfaces.

5TH SEMSESTER

UNIT -1 D PRINTING TECHNOLOGY:

Fused Deposition Modeling (FDM): This is the most common type of 3D printing, using filament to create objects layer by layer. You can delve into subtopics like different filament materials (ABS, PLA, etc.) and their properties, printing techniques (slicing, infill patterns, support structures), and applications of FDM printing.

Selective Laser Sintering (SLS): This process uses lasers to sinter (fuse) powdered materials like nylon or metal to create strong and durable objects. Subtopics can include different powder materials and their properties, applications for SLS in prototyping and end-use parts, and considerations for designing for SLS printing.

UNIT -2 ALTERNATIVE FUELS

Biofuels are derived from organic materials like plants, algae, or animal waste. They can be liquid fuels like biodiesel and ethanol, or gaseous fuels like biogas.

Feedstock production: Explore how different crops or plants are cultivated for biofuel production in a sustainable way.

Biofuel conversion technologies: Dive into the various methods used to convert biomass into usable biofuels like fermentation or gasification.

Biofuel life cycle assessment: Consider the environmental impact of biofuels throughout their entire lifecycle, from feedstock production to emissions.

Hydrogen: Hydrogen is a clean-burning fuel that can be produced from water through electrolysis. Hydrogen fuel cells can power electric vehicles with zero tailpipe emissions.

- a. **Hydrogen production:** Explore different methods for hydrogen production, including electrolysis using renewable energy sources.
- b. **Hydrogen storage and transportation:** Investigate the challenges and advancements in storing and transporting hydrogen fuel for vehicles.
- c. **Fuel cell technology:** Delve into the workings of hydrogen fuel cells and ongoing research to improve their efficiency and durability.

6TH SEMESTER

UNIT -1 : FLUID POWER IN AGRICULTURE

- 1) **Hydraulic Systems:** These are the most common type, using pressurized oil to transfer power and operate implements. Hydraulic systems are well suited for applications requiring high force and precise control.
- 2) **Pneumatic Systems:** These utilize compressed air for powering implements that require less force but high speed, like seeders or fertilizer spreaders. Pneumatic systems are often preferred for less demanding applications due to their lower cost and simplicity.
- 3) **Applications of Fluid Power in Agricultural Equipment:**
 - **Tractors and Implements:** Fluid power enables functions like steering, raising and lowering implements, and operating attachments. For example, a tractor's powerful hydraulic system allows it to lift and lower heavy attachments like loaders or mowers with ease.

Planting and Seeding Equipment: Precise control of seed depth and spacing is achieved through fluid power systems. Hydraulic planters can precisely plant seeds at a consistent depth and spacing, which is crucial for maximizing crop yield.

UNIT -2 SUSTAINABLE MACHINE DESIGN

- 1) **Energy Efficient Design:**
 - a) Minimize energy consumption during operation. This might involve:
 - i) Optimizing component selection for efficiency (e.g., using high-efficiency motors).
 - ii) Employing lightweight design principles to reduce energy needed for movement.
 - iii) Integrating renewable energy sources like solar or wind power to supplement the machine's needs.
- 2) **Design for Disassembly and Remanufacturing:**
 - a) Focus on designing machines that can be easily disassembled at the end of their useful life. This allows for:
 - i) Reusing components in new machines, reducing waste.
 - ii) Efficient recycling of materials for future use.
 - iii) Standardize components for easier disassembly and remanufacturing.
- 3) **Sustainable Manufacturing Processes:**
 - a) Look beyond the machine itself and consider the environmental impact of its manufacturing process. This might involve:
 - i) Reducing energy consumption within the manufacturing process.
 - ii) Minimizing waste generation during production.
 - iii) Utilizing sustainable materials and practices throughout the supply chain.

4) **Life Cycle Design:**

- a) Consider the entire life cycle of the machine, from raw material extraction to disposal or recycling. This involves:
 - i) Designing for longevity and ease of maintenance.
 - ii) Using modular designs for easier upgrades and repairs.
 - iii) Implementing strategies to minimize environmental impact at each stage of the machine's life cycle.

