DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

CIRCULAR NO.SU/B.Sc./CBC&GS/92/2024

It is hereby inform to all concerned that, the Revised syllabi prepared by the Ad-hoc Board and recommended by the Dean, Faculty of Science & Technology, **Academic Council at its meeting held on 08 April 2024 has accepted** the following Syllabi under the Faculty of Science & Technology **as per Norms of Choiced Based Credit Grading System** run at the Affiliated Colleges, Dr.Babasaheb Ambedkar Marathwada University as appended herewith.

Sr.No.	Courses	Semester
1.	**B.Sc.Automobile Technology (Degree)**	**Vth & VIth semester**
2.	**B.Sc.Workshop Technology (Degree)**	**Vth & VIth semester**
3.	**B.Sc.Refrigration and Air Conditioning (Degree)**	**Vth & VIth semester**

This is effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.SU/2024/26149-57
Date:- 15.05.2024

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Deputy Registrar,
Academic Section

Copy forwarded with compliments to :-

1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,

2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

1] **The Director, Board of Examinations & Evaluation,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
7] The Record Keeper, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

Dr. Babasaheb Ambedkar Marathwada University
Aurangabad – 431004 (MS) India

Undergraduate Bachelor Degree Program

in Science & Technology

Workshop Technology [Vth & VIth Semester]

Course Structure and Curriculum

(Outcome Based Curriculum)

Choice Based Credit System

(Effective from Academic Year 2022-23)

Dr. Babasaheb Ambedkar Marathwada University
Aurangabad – 431004 (MS) India

Dr. Prashant Ambad

Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar

Choice Based Credit System (CBCS) Curriculum For

Faculty of Science & Technology

Course Structure and Scheme of Examination

B.Sc. Workshop Technology Undergraduate Degree Program

Semester V

	Course Code	Course Title	Teaching Time / Week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1 A) Discipline Specific Elective	WT-511	Select Any One Paper A1) Tool Engineering I B1) Industrial Hydraulics And Pneumatics I	2 hours	2	50	10	40	20
	WT -512	Select Any One Paper A2) Quality Engineering & Industrial Management I B2) Disaster Management I	2 hours	2	50	10	40	20
	WT -521	Lab Course 6 Based on WT -511	3 hours	1.5	50	10	40	20
	WT -522	Lab Course 7 Based on WT -512	3 hours	1.5	50	10	40	20
Optional II (DSC-2 A) Discipline Specific Elective	WT -513	Select Any One Paper A1) Mechatronics I B1) Product Design And Development I	2 hours	2	50	10	40	20
	WT -514	Select Any One Paper A2) Robotics I B2) Automation In Manufacturing)	2 hours	2	50	10	40	20
	WT -523	Lab Course 6 Based on WT -513	3 hours	1.5	50	10	40	20
	WT -524	Lab Course 7 Based on WT -514	3 hours	1.5	50	10	40	20
Optional III (DSC-3 A) Discipline Specific Elective	WT -515	Select Any One Paper A1) Advance Manufacturing Processes I B1) Engineering Economics And Financial Management I	2 hours	2	50	10	40	20
	WT -516	Select Any One Paper A2) Industrial Engineering I B2) Automation And Control Engineering I	2 hours	2	50	10	40	20
	WT -525	Lab Course 6 Based on WT -515	3 hours	1.5	50	10	40	20
	WT -526	Lab Course 7 Based on WT -516	3 hours	1.5	50	10	40	20
Skill Enhancement Course (SEC 3)	WT -517	Sec-3 Any one Skills Chosen out of two SEC (E) : Leadership Skills SEC (F) : Entrepreneurship Skills	2 Hours	2	50	10	40	20
Non Credit Course / Additional Credits	WT -518	Professional Ethics and Moral Values	2 Hours	2*	50	50	**	20
			34 Hours	23	650	170	480	

Total Credits for Semester V : 23 (Theory : 14 ; Practical : 9)

Dr. Prashant Ambad

Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar

Choice Based Credit System (CBCS) Curriculum For

Faculty of Science & Technology

Course Structure and Scheme of Examination

B.Sc. Workshop Technology Undergraduate Degree Program

Semester VI

	Course Code	Course Title	Teaching Time / Week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1 B) Discipline Specific Elective	WT -611	Select Any One Paper A1) Tool Engineering II B1) Industrial Hydraulics And Pneumatics II	2 hours	2	50	10	40	20
	WT -612	Select Any One Paper A2) Quality Engineering & Industrial Management II B2) Disaster Management II	2 hours	2	50	10	40	20
	WT -621	Lab Course 6 Based on WT -611	3 hours	1.5	50	10	40	20
	WT -622	Lab Course 7 Based on WT -512	3 hours	1.5	50	10	40	20
Optional II (DSC-2 B) Discipline Specific Elective	WT -613	Select Any One Paper A1) Mechatronics II B1) Product Design And Development II	2 hours	2	50	10	40	20
	WT -614	Select Any One Paper A2) Robotics II B2) Computer Integrated Manufacturing	2 hours	2	50	10	40	20
	WT -623	Lab Course 6 Based on WT -613	3 hours	1.5	50	10	40	20
	WT -624	Lab Course 7 Based on WT -614	3 hours	1.5	50	10	40	20
Optional III (DSC-3 B) Discipline Specific Elective	WT -615	Select Any One Paper A1) Advance Manufacturing Process II B1) Engineering Economics And Financial Management II	2 hours	2	50	10	40	20
	WT -616	Select Any One Paper A2) Industrial Engineering II B2) Automation And Control Engineering II	2 hours	2	50	10	40	20
	WT -625	Lab Course 6 Based on WT -615	3 hours	1.5	50	10	40	20
	WT -626	Lab Course 7 Based on WT -616	3 hours	1.5	50	10	40	20
Skill Enhancement Course (SEC 3)	WT-617	Sec-4 Any one Skills Chosen out of two SEC (G) : Creative Abilities SEC (H) : Digital Skills	2 Hours	2	50	50	**	20
			32 Hours	23	650	170	480	
Total Credits for Semester V : 23 (Theory : 14 ; Practical : 9)								

Dr. Prashant Ambad

B.Sc. Workshop Technology (CBCS P-2022)

Semester V

WT-511:A1:- Tool Engineering I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

This course is designed to provide students with a comprehensive understanding of cutting tools, their materials, and specifications. It covers the essential elements of machining processes, the mechanics of chip formation, and the impact of tool geometry and cutting conditions on machining processes.

Course Objective:

1. To introduce students to the fundamentals of cutting tools and their materials.
2. To provide students with knowledge of the elements of machining processes.
3. To familiarize students with single-point cutting tools, their specifications, geometry, and design.
4. To enable students to understand the classification, nomenclature, and selection of multi-point cutting tools.
5. To introduce students to advanced tools and the specifications of grinding wheels.

Course Outcome:

By the end of this course, students will be able to:

1. Classify cutting tools and understand the properties of cutting tool materials.
2. Analyze the mechanics of chip formation and the role of tool geometry in machining processes.
3. Describe the design and geometry of single-point cutting tools and the formation of built-up edges.
4. Identify and select multi-point cutting tools for various machining operations.
5. Comprehend advanced tools and their applications in machining.
6. Explain grinding specifications, mechanics, and the impact of grinding conditions on wheel wear and grinding ratios.

Syllabus

Unit 1: Elements Of Machining Process **(8 Hrs)**

- Definition of cutting tool, Classification of cutting tools. Cutting tool materials & their properties.
- Basic requirement of machining process. Tools signature. Mechanics of chip formation.
- Geometry of chip formation, Types of chips. Effect of tool geometry and cutting conditions on machining process.
- Tools wear, Tool Life. **Cutting Fluids** – Types, Properties, Applications.

Unit 2: Single Point Cutting Tool **(6 Hrs)**

- Various systems of specifications. Single point cutting tool geometry and their inter-relation.
- Theories of formation of built-up edge and their effect. Design of single point.
- Contact tools throwaway inserts.

Unit 3: Multipoint Cutting Tools **(16 Hrs)**

- **Drill** – Classification and Nomenclature. Drill point geometry, Selection of drill for various operations.
- **Reamers** - Classification and Nomenclature. **Milling Cutter:**Classification and Nomenclature of end mill, plain milling cutter.
- **Taps** - Classification and Nomenclature. **Broches** - Classification and Nomenclature. **Hob** - Classification and Nomenclature.
- **Advance tools. Grinding:** Specifications of grinding of grinding wheel, mechanics of grinding. Effect of Grinding conditions on wheel wear and grinding ratio. Depth of cut, speed, machining time, temperature power.

Reference Books

1. Donaldson, Lucian &Goold, "Tool Design" TMH
2. M.H.A. Kempster "Introduction of Jigs &Fisture"
3. P.H.Joshi "Jigs & Fixtures"
4. P.C.Sharma "A Textbook of Production Engineering" S.Chand

WT-511:B1:- Industrial Hydraulics And Pneumatics I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description :

"Industrial Hydraulics and Pneumatics - I" provides students with a fundamental understanding of hydraulic and pneumatic systems commonly used in industrial applications. This course covers the principles of fluid power, hydraulic components, and their applications.

Course Objectives:

1. To provide students with a comprehensive understanding of fluid properties.
2. To introduce the principles and applications of various types of turbines and pumps, along with their construction.
3. To familiarize students with control valves, their types, symbols, and applications in hydraulic.
4. To equip students with knowledge of pneumatic systems.
5. To enable students to grasp the construction, working, and applications of actuators.

Course Outcomes:

Upon successful completion of this course, students should be able to:

1. Explain the properties of oil and fluid and their significance in hydraulic and pneumatic systems.
2. Analyze the working principles and applications of turbines and pumps.
3. Identify, interpret, and use graphic symbols for control valves and understand their functions in fluid power systems.
4. Differentiate between pneumatic and hydraulic systems, assess their advantages and disadvantages.
5. Demonstrate a deep understanding of actuators, their construction, and working.

Syllabus

Unit 1: Properties of Oil & Fluid **(6 Hrs)**

- Introduction to Fluids: Definition, Classification, and Applications,
- Properties of Fluids, Static Pressure and Pascal's Law,Centre of Pressure for Different Surfaces
- Atmospheric Pressure, Gauge Pressure and Vacuum Pressure,Pressure Measurement Devices

Unit 2: Turbines and Pumps **(8 Hrs)**

- Turbines: Classification, Construction, Working, and Applications, Pumps: Classification, Construction, Working
- Types of Casings and Impellers,Priming of Centrifugal Pumps
- Reciprocating Pumps: Classification, Construction, Working, and Applications

Unit 3: Control Valves **(8 Hrs)**

- Graphic Symbols, Types of Control Valves: Poppet Valve, Spool Valve, Rotary Valve, Pilot Operated Valve
- Check Valves: Pilot Operated Check Valve, Restriction Check Valve
- Shuttle & Fast Exhaust Valve, Sequence Valve, Time Delay Valve, Proportional Valves,Control Valve Applications

Unit 4: Pneumatic System **(8 Hrs)**

- Introduction to Pneumatic,Comparison of Pneumatic, Hydraulic, and Electrical Systems
- Air Compressor Systems, Types of Compressors and Compressor Specifications
- Filters: Classification and Working Principles, Direction Control Valves: Ways and Position of Direction Control Valves
- Important Characteristics of Pneumatic Direction Control Valves

Reference Books:

1. "Hydraulics and Pneumatics: A Technician's and Engineer's Guide" by Andrew Parr.
2. "Introduction to Hydraulics and Pneumatics" by S. Ilango and V. Soundararajan.
3. "Hydraulics & Fluid Mechanics" by Modi Seth (Standard Book House).
4. "Pneumatics System Principal & Maintenance" by S.R. Mujumdar.

WT -512:A2:- Quality Engineering & Industrial Management I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

This course is designed to provide students with an understanding of fundamental concepts related to quality engineering and industrial management. It covers topics such as quality philosophy, motivation, process management, and the cost of quality. Students will gain knowledge and skills that are essential for effective management in industrial settings.

Course Objectives:

1. To introduce students to the goals and principles of management in organizations.
2. To provide insights of quality, its history, and its connection to productivity and quality improvement.
3. To familiarize students with motivation theories and behavioral aspects of employees in organizational settings.
4. To explore the concepts of process management, including process choice, design, and improvement.
5. To understand the cost of quality and its impact on organizational performance.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Describe the fundamental goals and principles of management in organizations.
2. Explain the philosophy of quality and its development, as well as its impact on productivity and quality improvement.
3. Analyze motivation theories and their application to employee behavior in organizations.
4. Evaluate various aspects of process management, including process choice, design, and improvement.
5. Understand the concept of the cost of quality, its components, and its significance in managing organizational performance.

Syllabus

Unit 1: Introduction **(3 Hrs)**

- Goals of managers and Organizations, Scientific management,
- Principal of management, Behavioral science, Fayols operational management.

Unit 1: Quality Philosophy **(12 Hrs)**

- The meaning of quality & quality improvement ; Brief history of quality methodology,
- Quality Goals & quality policies, Quality Characteristics, Sporadic and chronic quality problems,
- Total Quality management- Quality philosophy, Links between quality & productivity,
- quality improvement, Management mindset- Cornet stone for preparing TQM,
- managing the transition of TQM. 5S, SIX SIGMA, WHY-WHY, 5H.

Unit 1: Motivation And Behavior **(5 Hrs)**

- Hawthorns studies and its findings, Maslow's theory, C and Y theory, Pretense ofneed and satisfaction of needs,
- Goal Oriented Behavior, Integration of organization goals and needs of employee.

Unit 1: Process Management **(7 Hrs)**

- Definitions of process management,
- Major process decision – Process choice, Vertical integration, resources flexibility,
- customer involvement, capital intensity, relationships between decision,
- service operation, Designing processes, Rearranging andprocess improvement.

Unit 1: The Cost of Quality **(3 Hrs)**

- Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost information,

- Accounting Systems and Quality Management.

Reference Books:

1. "Principles of Management" by Koontz and O'Donnell
2. "Statistical Quality Control" by E.L. Grant and R.S. Leavenworth
3. "Essentials of Management" by Koontz and Weirich
4. "Management of Organizational Behavior" by Hersey, Paul, and Kenneth H.
5. "Operations Management: Strategy and Analysis" by Lee J. Krajewski and Larry P. Ritzman
6. "Organizational Behavior" by Stephen P. Robbins

WT -512:B2:- Disaster Management I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

The "Disaster Management-1" course is designed to provide students with a comprehensive understanding of disasters, their implications, and the various types and magnitude of both natural and man-made disasters. It covers the economic, environmental, and human consequences of disasters.

Course Objectives:

1. To introduce students to the concept of disasters, including their definition, factors, and significance.
2. To differentiate between hazards and disasters and understand the nature and types of natural and man-made disasters.
3. To explore the economic, ecological, and human repercussions of disasters and their impact on society.
4. To provide insights into specific natural disasters such as earthquakes, cyclones, floods, and man-made disasters.
5. To familiarize students with disaster-prone areas in India and the specific hazards they face.

Course Outcomes:

By the end of this course, students will be able to:

1. Define and explain the concept of disasters and hazards.
2. Differentiate between natural and man-made disasters and understand their significance.
3. Describe the economic, ecological, and human consequences of disasters.
4. Identify and discuss various types of natural disasters and their characteristics.
5. Analyze man-made disasters and their impact on society and the environment.
6. Evaluate the disaster-prone areas in India and understand their specific vulnerabilities to different types of hazards.

Syllabus

Unit 1:Introduction to Disasters **(5 Hrs)**

- What is a disaster?, Factors contributing to disasters
- Significance of understanding disasters, Differentiating between hazards and disasters

Unit 2:Effects of Disasters and Hazards **(15 Hrs)**

- Economic impact of disasters, Loss of human and animal lives, Damage to ecosystems
- Various types of natural disasters, including earthquakes, volcanoes, cyclones,
- tsunamis, floods, droughts, famines, landslides, and avalanches
- Man-made disasters like nuclear reactor meltdowns,industrial accidents,
- oil spills, disease outbreaks, and conflicts

Unit 3: Disaster-Prone Areas in India **(10 Hrs)**

- Studying seismic zones
- Identifying areas susceptible to floods and droughts
- Assessing the risk of landslides and avalanches
- Recognizing regions prone to cyclones and coastal hazards,
- with a special focus on tsunamis
- Post-disaster health concerns, including diseases and epidemics

Recommended Texts and References:

1. "Disaster Management in India: Perspectives, Issues, and Strategies" by R. Nishith and Singh AK
2. "Disaster Mitigation Experiences and Reflections" edited by Sahni, Pardeep Et. Al.
3. "Disaster Administration and Management: Text and Case Studies" by Goel S. L.

WT -521: Practical Based on WT 511

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

WT-511:A1:- Tool Engineering I

1. Study of Cutting Tool Materials and Their Properties
2. Study of Tool Signature
3. Study of Chip Formation
4. Measurement of Tool Wear and Tool Life
5. Study of Cutting Fluids
6. Analysis of Single Point Cutting Tool Geometry
7. Study of Built-Up Edge Formation
8. Design and Analysis of Contact Tools
9. Study of Multipoint Cutting Tools
10. Grinding Wheel Specifications and Mechanics of Grinding

WT-511:B1:- Industrial Hydraulics And Pneumatics I

1. Measurement of Fluid Properties
2. Study of Pressure Measurement Devices
3. Study of Turbines and Pumps
4. Demonstration of Pump Priming
5. Study of Control Valves
6. Demonstration of Pneumatic System
7. Comparison of Pneumatic, Hydraulic, and Electrical Systems
8. Study of Air Compressor Systems
9. Demonstration of Direction Control Valves
10. Study of Pneumatic Filters

WT -522: Practical Based on WT 512

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

WT -512:A2:- Quality Engineering & Industrial Management I

1. Managerial Goals and Organizational Objectives
2. Introduction to Quality Methodology
3. Total Quality Management (TQM) Principles
4. Motivation Theories
5. Process Management Principles
6. Cost of Quality Analysis
7. Quality Characteristics and Policies
8. Employee Needs and Organizational Goals
9. Process Design and Improvement
10. Transition to Total Quality Management (TQM)

WT -512:B2:- Disaster Management I

1. Identifying Hazardous Locations: Map disaster-prone areas in India based on seismic zones, flood susceptibility, etc.
2. Case Study Analysis: Analyze past disasters to understand economic impact, loss of life, etc.
3. Field Visit: Visit a disaster-prone area or site affected by a disaster.
4. Disaster Simulation: Simulate a disaster response scenario.
5. Risk Assessment Exercise: Assess risk in a local area and suggest mitigation measures.
6. Emergency Response Planning: Develop an emergency response plan for a hypothetical scenario.
7. Disaster Preparedness Drill: Conduct a drill to test preparedness.
8. GIS Mapping: Use GIS software to map disaster-prone areas.
9. Community Awareness Program: Educate a local community about disaster risks.
10. Relief and Rehabilitation Study: Analyze relief and rehabilitation efforts after a disaster.

WT-513:A1:- Mechatronics I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

This course provides an introduction to the fundamental concepts and building blocks of Mechatronics, focusing on digital electronics, logic design, and operational amplifiers. Students will learn the principles of number systems, Boolean algebra, logic gates, sequential logic, operational amplifiers, and electronic timers.

Course Objectives:

1. Introduce students to the core principles of digital electronics
2. Familiarize students with Boolean algebra and its application in simplifying logic functions
3. Teach students about sequential circuits and understand their role in Mechatronics systems.
4. Provide a comprehensive understanding of operational amplifiers
5. Introduce students to electronic timers, enhancing their practical skills in Mechatronics.

Course Outcomes:

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

1. Apply knowledge of number systems and binary arithmetic to perform conversions digital data effectively.
2. Analyze and design logic circuits to solve complex digital logic problems.
3. Design and implement sequential logic circuits, for Mechatronics applications.
4. Utilize operational amplifiers for various linear and nonlinear applications.
5. Implement electronic timer circuits and Schmitt triggers for precise timing control in Mechatronics systems.

Syllabus

Unit 1: Introducing Mechatronics **(2 Hrs)**

- What is Mechatronics? Systems , Measurement systems , Control systems .
- Microprocessor-based controllers, Response of systems.

Unit 2: Number Systems and Boolean Algebra **(10 Hrs)**

- Introduction to Number Systems:- TYPES OF various number systems, Conversions between different number systems (binary, decimal, octal & hexadecimal number).
- Logic Gates and Basic Logic Operations:- Introduction to logic gates (AND, OR, NOT, etc.).Basic logic operations and truth tables. , Derived Gates and Arithmetic Circuits:- Special logic gates (NAND, NOR, XOR, XNOR, etc.).
- Boolean algebra:-Principles of Boolean algebra, Boolean expressions and simplification.

Unit 3: Sequential Logic Circuits **(7 Hrs)**

- Introduction of Flip-Flops and Their Types (SR, D, JK, T)., Shift Registers: - SISO, PISO, SIPO, PIPO.
- Introduction to counters in digital circuits. (Synchronous, asynchronous, up/down).
- Timers: - Schmitt trigger, 555 Timer and its applications in signal conditioning.

Unit 4: Combinational AND ARITHMATIC Logic Circuits **(7 Hrs)**

- Half Adder , Full Adder. Half Subtractor, Full Subtractor
- D/A Converters, A/D Converters, Multiplexer, Demultiplexer

Unit 5: Operational Amplifiers (Op-Amps) Introduction **(4 Hrs)**

- Introduction , Op-Amps Parameters, Linear Application of Op-Amps , Non- Linear Application of Op-Amps

References:-

1. Modern Digital Electronics by R.P. Jain
2. Introduction to Mechatronics and Measurement Systems by DavidGlciator.Michael BHistand .
3. Mechatronics by W.Bolton
4. Mechatronics by HMT Limited

WT-513:B1:- Product Design and Development I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description

"Product Design and Development-1" is a comprehensive course that introduces students to the world of product design, development, and commercialization. The course focuses on the entire lifecycle of product creation, from conceptualization to design, development, and production. Students will explore the critical phases of product design and development, emphasizing sustainable practices and the latest industry standards.

Course Objectives:

1. To equip students with an understanding of the product design process and its importance.
2. To address the obstacles faced in bringing a product to market and achieving commercial success.
3. To emphasize the significance of reverse engineering in product development.
4. To guide students in designing products that meet customer needs and market demands.
5. To instill the knowledge of creating a design validation plan to ensure product quality and performance.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Students will be able to Design Sustainable Products.
2. Students will be able to Manage the Product Development Lifecycle.
3. Students will be able to Integrate Customer Needs.
4. Students will be able to Apply Creative Problem-Solving.
5. Students will be able to Assess Technical Feasibility.

Syllabus

Unit 1: Introduction to Product Design and development (10 hours)

- Definition of product design, Essential Factors for product design, Product design phases,
- Modern approaches to product design,
- standardization, simplification and specialization in product design product development,
- product development versus product design, product development team and product development planning,
- modern product development process with reference to ISO standard, product testing, product validation,
- Product verification and production validation.

Unit 2: Product Development –Technical and Business Concerns (10 hours)

- Mission Statement and Technical Questioning, Technology Forecasting and S Curve, Customer Needs and Satisfaction,
- Customer Needs - Types and Models, tools for Gathering Customer Needs , Analysis of Gathered Information,
- Customer Population and Market Segmentation, Economic Analysis of Product (Numerical).

Unit 3: Product Development from Concept to Product Function (10 hours)

- Product information gathering, brainstorming and lateral thinking, morphological analysis of product,
- Generating concepts, concept selection - design evaluation, estimation of technical feasibility, concept selection process,
- Pugh's concept, selection charts, (numerical)concept scoring, process of concept embodiment, system modeling,
- functional modeling and decomposition, fast method, subtract and operate procedure.

Reference Books:

1. "Product Design and Manufacturing" by K. Chitale and R.C. Gupta, Prentice Hall India.
2. "Engineering Design" by George E. Dieter, McGraw Hill Pub. Company.
3. "Product Design: Techniques in Reverse Engineering and New Product Development" by Kevin Otto and Kristin Wood, Pearson Education Inc.

WT -514:A2:-Robotics I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

This course on Robotics provides an in-depth understanding of the fundamental principles, components, and technologies that underlie robotic systems. It covers topics ranging from the basics of robotics to the anatomy of robots, their classification, drive technology, and actuation methods. The course also delves into the design and analysis of end effectors, actuators, and motors used in various robotic applications.

Course Objectives:

1. To provide students with a comprehensive introduction to the field of robotics.
2. To familiarize students with the various classifications of robots based on their design, mobility, and application.
3. To delve into the components that make up a robot, including drive technology, envelope geometry.
4. To equip students with the knowledge and skills needed to design and analyze robot end effector.
5. To provide a comprehensive understanding of different types of actuators, including hydraulic, pneumatic, linear, rotary, and electric actuators, as well as motors such as servo and stepper motors.

Course Outcomes:

Upon completing this course, students will be able to:

1. Describe the fundamentals of robotics, its historical development, and its role in automation.
2. Categorize robots based on their design and application, highlighting the diverse types of robots
3. Understand the significance of drive technology, envelope geometry, and motion control methods in robot design.
4. Develop and analyze end effector s considering gripper force and design principles.
5. Evaluate the advantages, limitations, and applications of various actuators, motors.
6. Apply the gained knowledge to real-world applications.

Syllabus

Unit 1: FUNDAMENTALS OF ROBOTICS **(8 Hrs)**

- Definition and history of robot, Automation and robotics
- Robot anatomy, Robot classification, Drive technology, Envelope geometry
- Motion control method, Robot speciation

Unit 2: ROBOT END EFFECTORS **(8 Hrs)**

- Mechanical gripper- types of gripper mechanism
- Types of grippers. Vacuums, Magnetic, Adhesive gripper.
- Tool as end effector, Gripper force analysis and design,

Unit 3: ROBOT ACTUATOR **(14 Hrs)**

- Introduction of actuator,
- Hydraulic actuator:- Classification of hydraulic actuator, Advantage of hydraulic motor, application and limitations
- Hydraulic motor:- types of hydraulic motor, Advantage of hydraulic motor, application and limitations
- Pneumatic actuator:- working principle of pneumatic actuator, types, advantages, application and limitations
- Linear actuator:- working principle of linear actuator, types, advantages, application and limitations
- Rotary actuator:- working principle of rotary actuator, types, advantages, application and limitations
- Electric actuator :- working principle of electric actuator, types, advantages, application and limitations
- D.C. servo motor
- A.C. servo motor,
- Steeper motor.

Reference Books:

1. "Industrial Robotics"(Technology Programming and application) by M.P. Groover, M. Weiss, R.N. Nagel, N.G. Odrey McGraw, Hill 1996
2. S.R. Deb "Robotics Technology and Flexible Automation", Tata McGraw Hill 1994
3. K.S. Fu, R.C. Gonzalez and C.S.G. Lee "Robotics: Control, Sensors, Vision and Unintelligence", MCGraw-Hill 1987

WT -514:B2:- Automation in Manufacturing I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

IT is a course that delves into the principles and strategies of automation within production systems. It covers a broad range of topics, from the fundamentals of automation and its various levels to material handling, assembly lines, and automated production systems. The course explores both manual and automated assembly processes, providing students with a comprehensive understanding of the role of automation in modern manufacturing.

Course Objectives:

1. To introduce students to the fundamental principles of automation in manufacturing.
2. To provide insights into material handling systems.
3. To familiarize students with manual assembly lines, alternative assembly systems, and the design considerations.
4. To explore transfer lines, storage buffers, and their applications in automated production lines.
5. To introduce students to automated assembly systems, their design, and the quantitative analysis of assembly systems.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Explain the principles and strategies of automation in manufacturing, and analyze the various levels of automation.
2. Evaluate and design material handling systems, including material transport and storage.
3. Design and optimize manual assembly lines, taking into consideration line balancing and efficiency.
4. Analyze transfer lines with and without internal storage to enhance production line performance.
5. Understand the principles of automated assembly systems, design for automated assembly.

Syllabus

Unit 1: Introduction to Automation. **(5 Hrs)**

Automation in Production Systems-Automated Manufacturing Systems,Computerized Manufacturing Support Systems, Reasons for Automation, Automation Principles and Strategies. Manufacturing operations, Production Concepts and Mathematical Models. Costs of Manufacturing Operations, Basic Elements of an Automated Systems, Advanced Automation Functions, Levels of automation.

Unit 2: Introduction to Material Handling. **(9 Hrs)**

Overview of Material Handling Equipment, Considerations in Material Handling System Design, the 10 Principles of Material Handling. Material Transport Systems, Automated Guided Vehicle Systems, Monorails and other Rail Guided Vehicles, Conveyor Systems, Analysis of Material Transport Systems. Storage Systems, Storage System Performance, Storage Location Strategies, Conventional Storage Methods and Equipment, Automated Storage Systems, Engineering Analysis of Storage Systems. Automatic data capture-overview of Automatic identification methods, bar code technology, other ADC technologies.

Unit 3: Manual Assembly Lines & Transfer lines. **(10Hrs)**

Fundamentals of Manual Assembly Lines, Alternative Assembly Systems, Design for Assembly, Analysis of Single Model Assembly Lines, Line balancing problem, largest candidate rule, Kilbridge and Wester method, and Ranked Positional Weights Method, Mixed Model Assembly Lines, Considerations in assembly line design. Fundamentals of Automated Production Lines, Storage Buffers, and Applications of Automated Production Lines. Analysis of Transfer Lines with no Internal Storage, Analysis of Transfer lines with Storage Buffers.

Unit 4: Automated Assembly Systems. **(6 Hrs)**

Fundamentals of Automated Assembly Systems, Design for Automated Assembly, and Quantitative Analysis of Assembly Systems - Parts Delivery System at R19 M.Tech. Advanced Manufacturing Systems Work Stations, Multi-Station Assembly Machines, Single Station Assembly Machines, Partial Automation.

Textbook:

1. "Automation, Production Systems and Computer Integrated Manufacturing" by Mikell P. Groover, Pearson Education.

Reference Books:

1. "CAD CAM: Principles, Practice and Manufacturing Management" by Chris Mc Mohan, Jimmie Browne, Pearson Education (LPE).
2. "Automation" by Buckingham W, Harper & Row Publishers, New York, 1961.
3. "Automation for Productivity" by Luke H.D, John Wiley & Sons, New York, 1972.

WT -523: Practical Based on WT 513

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

WT-513:A1:- Mechatronics I

1. To study of binary addition half adder, full adder, 2 bit binary parallel adder
2. To study of binary substraction
3. To study of binary gray code conversion
4. To study operation of all logic gates
5. To study of flip flops
6. To study of shift resister
7. To study of 4 bit binary up-down counter
8. To study of johnsons counter
9. To study of analog to digital converter (adc)
10. To study of 555 timers

WT-513:B1:- Product Design and Development I

1. Define Product Design: Discuss the essential factors and phases involved in product design.
2. Modern Approaches: Explore standardization, simplification, and specialization in product design.
3. Product Development Team: Understand the composition and planning of a product development team.
4. ISO Standards: Study the product development process with reference to ISO standards.
5. Mission Statement: Develop a mission statement for product development.
6. Technology Forecasting: Use the S Curve model for technology forecasting.
7. Customer Needs Analysis: Gather and analyze customer needs using various tools.
8. Economic Analysis: Perform an economic analysis of a product.
9. Concept Generation: Use brainstorming and lateral thinking to generate product concepts.
10. Concept Selection: Select the best concept using evaluation methods like Pugh's concept selection charts.

WT -524: Practical Based on WT 514

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

WT -514:A2:-Robotics I

1. To Study Of Robot anatomy
2. To Study Of Motion control method
3. To Study Of Mechanical gripper
4. To Study Of Gripper force analysis and design
5. To Study Of Hydraulic actuator & Motor
6. To Study Of Pneumatic actuator & Motor
7. To Study Of Linear, Rotary, Electric actuator
8. To Study Of D.C. servo motor
9. To Study Of A.C. servo motor
10. To Study Of Steeper motor

WT -514:B2:- Automation in Manufacturing

1. Simulate manual vs. partially automated product assembly using Legos.
2. Research automated systems, calculate cost savings compared to manual processes.
3. Create a flowchart for a simple production process, identify automation opportunities.
4. Design and print a tool that automates a repetitive task in daily life.
5. Take a virtual tour of an automated manufacturing facility online.
6. Use different material handling methods to complete a scavenger hunt.
7. Design and build a model conveyor system from simple materials.
8. Implement a game where students use barcode scanners to identify objects.
9. Design the most efficient storage layout for a set of objects in a limited space.
10. Divide the class to debate the advantages and disadvantages of each approach.

WT-515:A1:- Advance Manufacturing Processes I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

This course provides an in-depth understanding of various advanced manufacturing processes, including forging, sheet metal working, and rolling of metals. Students will learn about the principles, equipment, and techniques associated with these processes.This course equips students with practical knowledge and skills in advanced manufacturing, enabling them to make informed decisions when selecting and applying these processes in real-world manufacturing scenarios.

Course Objective:

1. To introduce students to the classification and principles of advanced manufacturing processes.
2. To familiarize students with the equipment and machinery used in forging, sheet metal working, and rolling of metals.
3. To enable students to understand the factors influencing the selection of specific processes.
4. To develop problem-solving skills related to manufacturing processes.
5. To emphasize the importance of quality, safety, and efficiency in advanced manufacturing.

Course Outcome:

Upon completion of this course, students will be able to:

1. Classify and differentiate between hot and cold working processes.
2. Describe the equipment, tools, and machinery involved in each of these processes.
3. Analyze the factors influencing the selection of a particular manufacturing process for a given application.
4. Apply problem-solving skills to address challenges in advanced manufacturing processes.
5. Understand the significance of maintaining quality, safety, and efficiency in advanced manufacturing operations.

Syllabus

Unit 1: Hot and Cold Working Processes (10 Hrs)

A. Forging - Classification of forging processes-open die and closed die forging, stock penetration. Lubrication in tube drawing, Cold rolling, extrusion: forward, backward,impact, Wire & Tube Drawing: Introduction rod and wire drawing machines -Wire-drawing dies, material.

B. Forging equipment- Hammers and presses, construction working capacities and selection of equipment. Tube drawing: Methods, force calculation.

Unit 2: Sheet Metal Working (10 Hrs)

A. Studying of various processes such as shearing, blanking, punching, notching, bending, forming, drawing, – crank presses, toggle press, screw press.

B. single and double acting press, press brake coining, piercing, squeezing, Spinning,Drawing, Equipment used for sheet metal working

Unit 3: Rolling of Metals (10 Hrs)

A. Scope and importance of rolling. Types of Rolling Mills- Construction and working. Deformation in rolling and determination forces required. Process variables, Roll Defects in rolling. - Roll pass classification & design.

B. Lubrication in rolling Automatic gauge control flattening, Roll camber - its effect on rolling process, mill spring.

Text Books

1. Workshop Technology : Chapman, Vols.
2. Manufacturing Process : Hazra Chowdhary, Vol. 2.
3. Computer aided design & manufacturing by Zimmer & Groover
4. CAD Principles & Applications by PAUL C Bave

Reference Books

1. Chapman W.A.J.: "Workshop Technology" Volume I, II,III: ELBS.
2. Hajara choudhary S. K., Bose S. K. : "Elements of Workshop Technology", Volume I, II. Asia Publishing House:

WT-515:B1:-Engineering Economics and Financial Management I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description

The course provides students with a foundation in understanding the financial and economic aspects of the engineering field. It equips students with essential knowledge about economic terms, money, taxation, insurance, and depreciation. Students learn to analyze factors affecting the demand and supply of goods and services, the theory of interest, and the principles of taxation. The course introduces concepts related to money, exchange, and interest, and their real-world applications.

Course Objectives:

1. Understand key financial and economic terms used in the industry.
2. Comprehend the classification of money, taxation, and types of insurance.
3. Gain knowledge about depreciation and its importance.
4. Understand cost analysis.
5. Develop skills in keeping financial records and cost estimation.

Course Outcomes:

1. Handle various financial and economic terms used in the industry effectively.
2. Understand money exchange, different types of tax, and insurance.
3. Classify different costing methods.
4. Keep financial records accurately.
5. Apply economic principles to real-world situations.

Syllabus

Unit 1: Introduction **(12 hours)**

- Definition of various economic terms such as economic goods, utility,value, price, wealth,
- Attributes of wealth and its classification, wants and their characteristics,
- Classification of wants, standard of living, rent and profit, Factors of Production: Land, Lab our, Capital, Organization.Demand and Supply: Law of diminishing utility, marginal and total utility,
- Demand, Demand Schedule, Law of demand, Elasticity of demand, Factors governing the elasticity of demand,
- Law of substitution and its application, Supply, Law of supply, supply schedule,
- elasticity of supply, theory of value, equilibrium price, Laws of returns.Wages: Nominal and real wages,
- Factors affecting real wages, Wages, efficiency and standard of living, theory of wages, difference in wages,
- methods of wage payment

Unit 2: Money, Exchange and Interest **(12 hours)**

- Definition and function of money, Qualities of a good money, classification of money, value of money, index numbers, appreciation and depreciation of money, Gresham's Law and its limitations. Theory of exchange, barter, stock exchange,
- Speculation Taxation and Insurance: Principle of taxation, characteristics of a good taxation system,
- kinds of taxes and their merits and demerits, Vehicle Insurance and loss Assessment.Introduction, theory of interest,
- interest rate, interest rate from lender's and borrower's view point, simple and compound interest,
- Cash Flow Diagram, Interest formulas (discrete compounding, discrete payments), Nominal and effective interest rates, Numerical problems.

Unit 3: Depreciation **(6 hours)**

- Need for depreciation, Causes of depreciation, Life and salvage value, Methods of calculating depreciation and their merits and demerits, Numerical problems.

Reference Books:

1. Engineering Economics, Tara Chand, Nem Chand and Brothers, Roorkee
2. Engineering Economy, Thuesen, G. J. and Fabrycky, W. J., Prentice Hall of India Pvt. Ltd.
3. Mechanical Estimating and Costing, T. R. Banga and S. C. Sharma, Khanna Publishers, Delhi
4. Industrial Organization and Engineering Economics, T. R. Banga and S. C. Sharma, Khanna Publishers, New Delhi
5. Mechanical Estimating and Costing, D. Kannappan et al., Tata McGraw Hill Publishing Company Ltd., New Delhi
6. A Text Book of Mechanical Estimating and Costing, O. P. Khanna, Dhanpat Rai Publications Pvt. Ltd., New Delhi

WT -516:A2:-Industrial Engineering I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

This course provides a comprehensive introduction to the field of Industrial Engineering, focusing on improving productivity, work study, method study, and motion economy. It explores various techniques and principles to enhance workplace efficiency, reduce excess work content, and create standardized procedures. Students will learn to analyze and optimize work processes, ensuring a balance between productivity and employee well-being.This course equips students with the fundamental knowledge and practical skills necessary for industrial engineering and workplace efficiency. It emphasizes a balanced approach to enhance productivity while ensuring the well-being of employees.

Course Objectives:

By the end of the course, students will be able to:

1. Understand the significance of productivity in industrial and its relationship with the standard of living.
2. Define and apply work study concepts to analyze and improve work processes.
3. Utilize method study techniques to select, record, examine, and optimize work methods.
4. Implement principles of motion economy to reduce unnecessary motions and enhance task efficiency.
5. Develop standard operating procedures and work instructions, overcome resistance to change.

Course Outcomes:

Upon completing the course, students will be able to:

1. Recognize the importance of productivity and its impact on the standard of living.
2. Apply work study principles to analyze and enhance work processes.
3. Conduct method studies effectively by selecting appropriate jobs.
4. Evaluate work methods based on motion economy principles, leading to more efficient work processes.
5. Create standard operating procedures and work instructions to ensure consistent task execution.

Syllabus

Unit 1: Introduction : **(4 hours)**

- Productivity, Definition of work study, Scope, Application, Relationship between productivity and stranded of living,
- Basic work content, Excess work content, Technique to reduce excess work content.

Unit 2: Work Study : **(8 hours)**

- Definition, Concept, Relation with productivity, Human factor, Good relation,Work study verses management,
- Supervisor, Work-study man, Quality of work-studyman Working conditions, Preventions accidents and hazards.

Unit 3: Method Study I **(8 hours)**

- Method Study - Definition, Steps in Method Study, Select – Various Considerations in Select Job for Method Study,
- Recording – Significance, Need, Charting Symbols,Recording Techniques - Charts and Diagrams,
- Examine – Questioning Techniques –Primary & Secondary Questions

Unit 4: Method Study II **(10 hours)**

- Introduction to Principles of Motion Economy, Develop – Alternate Methods of Doing Work,
- Evaluate – Criteria for Evaluating & Selecting Best Method, Define – Develop Standard Operating Procedures,
- Work Instructions, Implement – Practical Aspects in Implementing New Method, Overcoming Resistance to Change,
- Maintain Standard Operating Procedures – Developing SOPs, Responsibility Matrix, Standard Work Combination Charts

Reference Books:

1. "Job Evaluation" by Yoga M., NPC, New Delhi.
2. "Most Work Measurement Systems" by K.B. Zandin.
3. "Handbook of Industrial Engineering" by H.B. Maynard.
4. "Introduction to Work Study" by ILO.
5. "Motion & Time Study Design & Measurement of Work" by Ralph Barnes (Wiley Eastern).
6. "Work Study" by R.M. Currie & J. Faraday.
7. "Handbook of Industrial Engineering" by Irson & Grant.
8. "Just In Time" by David Hukins.

WT -516:B2:-Automation and Control Engineering I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

The course is a comprehensive program designed to introduce students to the principles, technologies, and practices of automation and control systems in various industries. The course covers topics such as sensors, actuators, control systems, PLC programming, HMI, SCADA, industrial communication, and cybersecurity. It emphasizes real-world applications and hands-on experience with modern automation technologies.

Course Objectives:

Upon completing the course, students will be able to:

1) Understand the fundamental concepts and significance of automation and control in industrial processes and systems.
2) Master the principles of control systems, including feedback control, stability, and Laplace transforms.
3) Gain proficiency in programming and implementing Programmable Logic Controllers (Plc) for industrial automation.
4) Develop skills in designing Human-Machine Interface (HMI) systems and utilizing SCADA for process control.
5) Familiarize themselves with industrial communication protocols, networking, and cyber security in automation.

Course Outcomes:

By the end of the course, students will be able to:

1) Describe the key components and functions of automation and control systems.
2) Analyze and design control systems, considering aspects such as feedback, stability, and transfer functions.
3) Program and implement PLCs to control industrial processes, troubleshooting and optimizing these systems.
4) Develop and interface with Human-Machine Interface (HMI) systems and create functional SCADA applications .
5) Evaluate industrial communication protocols, design networked automation systems, and address cyber security challenges.

Unit 1: Introduction to Automation and Control **(6 hours)**

- Definition and Significance of Automation , Evolution of Automation and Control Systems.
- Basic Concepts in Control Systems.Types of Automation and Their Applications.

Unit 2: Sensors and Actuators **(8 hours)**

- Introduction to Sensors , Classification of sensors.Types of Sensors .
- Actuators in Automation Systems, Types of actuators, including motors, solenoids, and pneumatic actuators.
- Selection, Installation, and Calibration of Sensors and Actuators.

Unit 3: Control Systems Basics **(6 hours)**

- Feedback Control Systems, Components of a feedback control system. Block Diagrams and Transfer Functions
- Control System Stability and Analysis. Introduction to Laplace Transforms and Their Use.

Unit 4: Control Systems Design **(10 hours)**

- PID Controllers - Proportional, Integral, Derivative Control . Tuning of Control Parameters in PID Controllers .
- State-Space Representation of Control Systems.Introduction to Frequency Domain Analysis.

Reference Books:

1. "Industrial Automation and Process Control" by Jon Stenerson and Randal Wilson.
2. "PLC Programming using RSLogix 500: Basic Concepts of Ladder Logic Programming!" by Gary D. Anderson.
3. "Automation, Production Systems, and Computer-Integrated Manufacturing" by Mikell P. Groover and Anil K. Chitkara.

4. "Programmable Logic Controllers: Industrial Control" by K. Shibu.
5. "Introduction to Industrial Automation" by K.A. Cole, Kelly Johnson, and R. Joe Hunt.

WT -525: Practical Based on WT 515

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

WT-515:A1:- Advance Manufacturing Processes I

1. Study of Forging and Forging Equipment
2. Determination of Force in Tube Drawing.
3. Sketch of Die for Extrusion and Wire-Drawing.
4. Study of Equipment used for Sheet Metal Working
5. Problem on Scrap Strip Lay-Out and Sheet Utilization.
6. Study of Rolling Process and Process parameters.
7. Problem on Roll-Pass Design.
8. Bend pre-cut sheet metal pieces into specific shapes using simple bending tools or jigs.
9. Practice basic cutting techniques (shearing, blanking, punching) on thin sheet metal using hand tools
10. Simulate a basic press using levers or hydraulic systems to visualize force application.

WT-515:B1:-Engineering Economics And Financial Management I

1. Barter system for exchanging simple goods (e.g., candies, buttons).
2. With limited resources (e.g., paperclips) and to fulfill various wants (e.g., build a tower).
3. Students with a list of items and have them categorize them as needs or wants. Discuss the difference and how income influences choices.
4. Representing land, labor, capital, and organization. how each factor contributes to production.
5. Use candies or other objects to demonstrate the relationship between price and quantity demanded. simple demand curve.
6. How price affects quantity supplied. plot a simple supply curve.
7. Demand and supply curve activities to show how price adjusts to reach equilibrium.
8. Hypothetical income and price scenarios. Challenge them to calculate real wages (purchasing power) and discuss factors affecting it.
9. Qualities needed for a good form of money (e.g., durability, portability, divisibility).
10. Stock market simulation using paper money and company cards.
11. Experience basic trading principles.

WT -526: Practical Based on WT 516

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

WT -516:A2:-Industrial Engineering I

1. Calculate productivity, and brainstorm improvements.
2. Identify unnecessary steps in a repetitive task and suggest elimination strategies.
3. Brainstorm alternative methods for a simple task and discuss benefits of method study.
4. Simulate work process observation and improvement suggestions.
5. Identify and report potential safety hazards in a designated area.
6. Discuss key work habits for successful work study.
7. Create a flowchart documenting steps involved in a simple task.
8. Practice asking "why" questions to understand the purpose of each step in a common activity.
9. Observe and suggest improvements for a task with inefficient movements.
10. Design a workplace layout considering principles of motion economy.

WT -516:B2:-Automation And Control Engineering I

1. Research and create a timeline showcasing key milestones in automation history.
2. Identify everyday objects or processes that involve automation.
3. Use dominoes or marbles to create a chain reaction demonstrating control systems.
4. Showcase different types of sensors and how they convert physical quantities into electrical signals.
5. Explore how actuators convert electrical signals into physical actions.
6. Create a simple thermostat simulation using a bimetallic strip to represent feedback control.
7. Build block diagrams representing simple control systems using paper or online tools.
8. Use a simulation or model to demonstrate the effect of proportional control on a system.
9. Develop a game where students adjust PID control parameters to achieve a desired outcome.
10. Use simulations or models to introduce the concept of frequency response.

WT-517: SEC (E) Leadership Skills

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 CA	

Objective:

- Understanding Leadership
- Risk Analysis Skills
- Learning from Success Stories
- Learn Stress Management Techniques
- Learn Client Relationship Building

Outcome:

- Ability to define leadership, identify types, traits, functions, and styles of leadership.
- Proficiency in estimating and managing risks through break-even point analysis.
- Understanding innovation and its impact on productivity and profitability through real-world examples.
- Mastery in stress management methods, including identifying types of stress and improving workplace stress.
- Proficiency in managing client relationships, understanding client requirements, and adopting a customer-centric approach.

Syllabus

Unit I Leadership (5 Hrs)

Define leadership, types of leadership, leadership Traits, Functions of leadership, styles of leadership. Resolving Individual differences among people.

Unit II : Risk Analysis tools (7 Hrs)

Estimate the risks that you could face in your role. In turn, this helps you manage these risks and minimize their impact on your plans. Break-even point analysis. Risk Value = Probability of Event x Cost of Event.

Unit III Success stories / Best Practices – (10 Hrs)

Inspection, inspect Demo displacement. Innovation has become one of the most popular buzz words of the Digital Age. Re-evaluate the true meaning of a concept than when it is being touted by individuals and companies around the world. Spark innovation, maximize productivity, and increase profitability as a result of implementing the Big Five behaviors.

Unit IV : Stress management – (8 Hrs)

Define Management, Type of stress Management, How to improve stress in workplace, Team leader in workplace. Manage relationships with client who may be confused with the services requirements. Build healthy client relationships and use customer centric approach

Text Books & references book

1. "Leadership Sutra: An Indian Approach to Power" by Devdutt Pattanaik - for Unit I: Leadership.
2. "Risk Management: The Indian Context" by Uma Sekaran - for Unit II: Risk Analysis Tools.

3. "The Innovation Sandbox: Building and Testing Products for India" by Ravi Venkatesan - for Unit III: Success Stories / Best Practices.
4. "Stress Management: A Holistic Approach" by Dr. S. K. Sharma - for Unit IV: Stress Management.

WT-517: SEC (F) Entrepreneurship Skills

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 CA	

Objective:

Understanding Entrepreneurship

Studying Competitive Advantage

Handling Sensitive Workplace Issues

Learning Marketing Tools

Understanding Market Strategy in Trade Theory

Outcome:

Ability to define entrepreneurship and implement self-employment strategies.

Mastery in analyzing PEST factors and implementing VRIO resources for competitive advantage.

Proficiency in defining and managing sensitive issues through policy development and communication.

Understanding the 7 Ps of marketing and their importance in market strategy.

Ability to utilize market strategy tools in labor market information for effective trade theory implementation.

Syllabus

Unit I Self Employment as a Career path (5 Hrs)

Define Entrepreneurship, Strategy of entrepreneurship, Market Research. Implementation of self Employment in workplace Ps, Mange self-employment in workplace. Quality consciousness – its relevance.

Unit II Study of Competitive Advantage Model. (10 Hrs)

PEST factors for external changes and implement VRIO resources for getting an edge over the competitors.

Ensure that environmental conditions are suitable for the client and the services to be carried. Deal with clients lacking the technical background to solve the problem on their own. Immediate or temporary solutions to resolve delays.

Unit III Strategies of handling sensitive issues: (10 Hrs)

(political, commercial, environmental, cultural, and so on) at workplace 1. Define the issues, 2. Develop Policies Adhering to Company Goals, 3. Communicate Policies, 4. Hold People Accountable and 5. Continue to Evolve.

Unit IV Marketing (5 Hrs)

Tools of marketing, 7 Ps define market strategy, important of market strategy, use of strategy in trade theory (Labour Market Information).

Text Books & References Books

1. "Entrepreneurship Development and Small Business Enterprises" by Poornima M. Charantimath - This book covers topics related to entrepreneurship, market research, and self-employment strategies.
2. "Competitive Advantage: Creating and Sustaining Superior Performance" by Jay B. Barney - While not authored by an Indian author, this book covers the concept of competitive advantage, including PEST analysis and VRIO framework

3. "Strategic Management: Text and Cases" by Azhar Kazmi - This book provides insights into handling sensitive issues in the workplace and developing strategies adhering to company goals
4. "Marketing Management: Text and Cases" by Rajan Saxena - This book covers various tools of marketing, the 7 Ps of marketing, and the importance of market strategy

B.Sc. Workshop Technology (CBCS P-2022)

Semester VI

WT-611:A1:-Tool Engineering II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

The course offers a comprehensive understanding of jigs, fixtures, tool life, tool wear, cutting temperature, cutting fluids, and cutting tool materials. It covers the principles of location, various methods of location, redundancy, fool-proofing, and the design and development of jigs and fixtures for different components. The course also delves into the theories of tool wear, the nature of frictional forces in metal cutting, and factors influencing tool life. Students will learn about cutting temperatures, the impact of heat in metal cutting, temperature distribution, and the role of cutting fluids. Additionally, the course covers cutting tool materials, their properties, and selection.This course prepares students to excel in tool engineering and play a vital role in optimizing machining processes, tool selection, and tool maintenance.

Course Objective:

1. To provide students with a comprehensive understanding of the principles the design and development of jigs and fixtures.
2. To familiarize students with the theories of tool wear, different wear mechanisms, and factors influencing tool life.
3. To enable students to comprehend cutting temperatures, the influence of heat in metal cutting, and the role of cutting fluids.
4. To introduce students to various types of cutting tool materials, their properties, composition, and applications.
5. To equip students with the knowledge and skills needed for the selection of cutting tool materials and their use.

Course Outcome:

By the end of this course, students will be able to:

1. Design and develop jigs and fixtures using principles of location and various methods.
2. Analyze the theories of tool wear and apply tool life criteria in machining.
3. Calculate and understand cutting temperatures, their distribution, and their impact on machining.
4. Select appropriate cutting fluids for different machining applications and understand their functions.
5. Evaluate cutting tool materials, their properties, and select the most suitable material for specific machining tasks.
6. Apply their knowledge to improve machining processes, reduce tool wear, and enhance overall machining efficiency.

Syllabus

Unit 1: Jig & Fixtures **(10 Hrs)**

- Principle of location, Twelve degree of freedom, 3-2-1 method of location, 4-2-1 method of location,
- Redundancy, fool proofing, Locating device, clamping device &indexing mechanism,
- **Drill jig** – types of drill bushes, Types of drill jigs, design and development procedure of jigs for different components,
- **Fixtures** – types of fixtures, Setting block, tennon, Clamping of fixtures, Design and development of milling,
- Turning/boring fixtures for different components

Unit 2: Tool Life and Tool Wear **(10 Hrs)**

- Theories of tool wear – adhesion, Abrasive and diffusion wear mechanisms, Forms of wear,
- Tool life criteria and machinability index. Types of sliding contact, Real area of contact,
- Laws of friction and nature of frictional force in metal cutting. Effect tool angle,
- Economics, cost analysis, mean co-effect of friction.

Unit 3: Cutting Temperature **(10 Hrs)**

- Sources of heat in metal cutting, influence of metal conditions, Temperature distribution, zones,
- Use of tool- work thermocouple for determination of temperature. Temperature distribution in metal cutting.
- **Cutting fluids:** Functions of cutting fluids, types of cutting fluids, Properties, selection of cutting fluids.
- **Cutting tool materials:** Historical developments, Essential properties of cutting tool materials, types.

- Composition and application of various cutting tool materials, Selection of cutting tool materials.

Reference Books

1. Donaldson, Lucian &Goold, "Tool Design" TMH
2. M.H.A. Kempster "Introduction of Jigs &Fisture"
3. P.H.Joshi "Jigs & Fixtures"
4. P.C.Sharma "A Textbook of Production Engineering" S.Chand

WT-611:B1:- Industrial Hydraulics And Pneumatics II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description :

"Industrial Hydraulics and Pneumatics - II" builds upon the knowledge acquired in the first part, delving deeper into the intricacies of fluid power systems in industrial settings. Students explore advanced concepts in hydraulic circuit design, control systems, and automation. Pneumatic system applications and troubleshooting are also covered in detail. This course emphasizes hands-on practical experience, enabling students to design and optimize complex industrial fluid power systems.

Course Objectives:

- To provide students with a comprehensive understanding of fluid properties.
- To introduce the principles and applications of various types of turbines and pumps, along with their construction.
- To familiarize students with control valves, their types, symbols in hydraulic and pneumatic systems.
- To equip students with knowledge of pneumatic systems.
- To enable students to grasp the construction, working, and applications of actuators, both pneumatic and hydraulic.

Course Outcomes:

Upon successful completion of this course, students should be able to:

- Explain the properties of oil and fluid and their significance in hydraulic and pneumatic systems.
- Analyze the working principles and applications of turbines and pumps, with the ability to select suitable pumps specific tasks.
- Identify, interpret, and use graphic symbols for control valves and understand their functions in fluid power systems.
- Differentiate between pneumatic and hydraulic systems, assess their advantages and disadvantages.
- Demonstrate a deep understanding of actuators, their construction, and working.

Unit 1: Actuators (8 Lectures)

- Pneumatic Cylinders and Motors
- Construction and Working of Actuators
- Types of Hydraulic Cylinders: Single and Double Acting Cylinders
- Special Hydraulic Cylinders: Telescopic and Tandem
- Specification and Cushioning of Hydraulic Cylinders
- Actuator Sizing and Selection

Unit 2: Hydraulic and Pneumatic Systems (7 Lectures)

- Hydraulic Systems: Components and Working
- Pneumatic Systems: Components and Working
- Hydraulic and Pneumatic System Maintenance
- Troubleshooting and Problem Solving
- Application of Hydraulics and Pneumatics in Industry

Unit 3: Safety and Regulations (5 Lectures)

- Safety Practices in Hydraulics and Pneumatics
- Environmental Impact and Regulations
- Standards and Codes for Industrial Fluid Power
- Case Studies in Industrial Hydraulics and Pneumatics

Unit 4: Future Trends (5 Lectures)

- Emerging Technologies in Fluid Power
- Automation and Industry 4.0 in Fluid Power Systems

- Sustainable Practices in Fluid Power
- Career Opportunities in Industrial Hydraulics and Pneumatics

Reference Books:

1) "Hydraulics and Pneumatics: A Technician's and Engineer's Guide" by Andrew Parr.
2) "Introduction to Hydraulics and Pneumatics" by S. Ilango and V. Soundararajan.
3) "Hydraulics & Fluid Mechanics" by Modi Seth (Standard Book House).
4) "Pneumatics System Principal & Maintenance" by S.R. Mujumdar.

WT -612:A2:- Quality Engineering & Industrial Management II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

This course builds upon the foundation of quality engineering and industrial management, focusing on Total Quality Management (TQM), customer satisfaction, organizational aspects, and ISO 9000 standards. It provides students with a deeper understanding of these topics and their practical applications in industrial settings.

Course Objectives:

1. To introduce students to the concept of Total Quality Management (TQM) and its relevance to business performance.
2. To emphasize the importance of top management's attitude and involvement in quality initiatives.
3. To explore the principles of customer focus and satisfaction.
4. To introduce students to the concept of benchmarking and its role in improving organizational processes.
5. To cover the organization of TQM, the transition from traditional to TQM-oriented organizations.
6. To provide an understanding of ISO 9000 standards.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Define Total Quality Management (TQM) and explain its significance in improving business performance.
2. Recognize the importance of top management's commitment, communication, and organizational culture .
3. Understand the dynamics of customer focus, satisfaction, and the role of marketing and sales in quality management.
4. Comprehend the concept of benchmarking, its benefits, and the procedures involved.
5. Describe the organization of TQM, the transition process, and the significance of Quality Circles.
6. Apply various tools of TQM, including stratification, check sheets, scatter diagrams, and Ishikawa diagrams.
7. Explain the importance of ISO 9000 standards, standardization techniques, and the benefits of ISO 9000 certification.

Syllabus

Unit 1: Introduction **(8 Hrs)**

The concept of TQM, Quality and Business performance, attitude andinvolvement oftop management, communication, culture and management systems.Management of Process Quality: Definition of quality, Quality Control, a brief history, ProductInspection vs. Process Control, Statistical Quality Control, Control Charts and AcceptanceSampling.

Unit 2: Customer Focus and Satisfaction **(8 Hrs)**

Process Vs. Customer, internal customer conflict, quality focus,Customer Satisfaction, role of Marketing and Sales, Buyer – Supplier relationships.Bench Marking: Evolution of Bench Marking, meaning of bench marking, benefits of benchmarketing,the bench marking procedure, pitfalls of bench marketing.

Unit 3: Organizing for TQM **(7 Hrs)**

The systems approach, Organizing for quality implementation, making thetransition from a traditional to a TQM organization, Quality Circles, seven Tools of TQM: Stratification,check sheet, Scatter diagram, lshikawa diagram, paneto diagram; Kepner & Tregoe Methodology.

Unit 4: Introduction of ISO 9000 **(7 Hrs)**

Definition of standardization, Techniques for standardization's, Codification system, Variety control, Value engineering. **ISO 9000**: Universal Standards of Quality: ISO around the world, The ISO 9000 ANSI/ASQC Q- 90.Series Standards, benefits of ISO 9000 certification, the third party audit, Documentation ISO9000and services, the cost of certification implementing the system.**07 Hours**

Reference Books

1. Principles of Management Koontz O Donnel McGraw Hill
2. Statistical Quality ControlE.L. Grant and R.S.Leavenworth,7th editionMcGraw Hill

3. Essentials of management Koontz Weirich7th EditionTATA McGraw Hill
4. Management ofOrganizational BehaviorHersey Paul andKenneth H,Prentice Hall ofIndiaPvt. Ltd.
5. Operations management strategyand analysis Lee J.Krajewski and Larry P.RitzmanFifth EditionAddison-Wiley.
6. Organizational Behavior Stephen P Robbins, 9th Edition Pearson Education

WT -612:B2:-Disaster Management II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

IT is an advanced course that delves into the various aspects of disaster preparedness, risk assessment, and mitigation. It emphasizes the importance of monitoring phenomena that can trigger disasters or hazards and evaluates risk using techniques like remote sensing, data analysis, and community participation.

Course Objectives:

1. To equip students with the knowledge and skills required for effective disaster preparedness and management.
2. To understand the significance of monitoring phenomena that can lead to disasters and evaluate risk.
3. To explore techniques for risk assessment, including the use of remote sensing and data from various sources.
4. To analyze global and national disaster risk situations and assess the role of people's participation in risk assessment.
5. To comprehend the concept of disaster mitigation, including structural and non-structural approaches.

Course Outcomes:

By the end of this course, students will be able to:

1. Develop a deep understanding of disaster preparedness and the role of monitoring phenomena that trigger disasters.
2. Conduct risk assessments using a variety of techniques and data sources.
3. Evaluate the global and national disaster risk situations and the importance of community participation in risk assessment.
4. Formulate strategies for disaster risk reduction and mitigation.
5. Analyze the effectiveness of both structural and non-structural mitigation approaches.

Syllabus

Unit 1: Disaster Preparedness And Management: **(10 Hrs)**

- Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard;
- Evaluation Of Risk:
- Application Of Remote Sensing,
- Data From Meteorological And Other Agencies,
- Media Reports: Governmental And Community Preparedness.

Unit 2: Risk Assessment Disaster Risk: **(10 Hrs)**

- Concept And Elements,
- Disaster Risk Reduction,
- Global And National Disaster Risk Situation.
- Techniques Of Risk Assessment,
- Global Co- Operation In Risk Assessment And Warning,
- People's Participation In Risk Assessment. Strategies for Survival.

Unit 3: Disaster Mitigation: **(10 Hrs)**

- Meaning,
- Concept And Strategies Of Disaster Mitigation,
- Emerging Trends In Mitigation.
- Structural Mitigation And Non-Structural Mitigation,
- Programs Of Disaster Mitigation In India.

Recommended Texts and References:

1. "Disaster Management in India: Perspectives, Issues, and Strategies" by R. Nishith and Singh AK
2. "Disaster Mitigation Experiences and Reflections" edited by Sahni, Pardeep Et. Al.
3. "Disaster Administration and Management: Text and Case Studies" by Goel S. L.

WT -621: Practical Based on WT 611

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

WT-611:A1:-Tool Engineering-2

1. Apply 3-2-1 or 4-2-1 methods to precisely locate workpieces using jigs & fixtures.
2. Design jigs with redundancy and foolproofing to prevent errors.
3. Master using locating devices, clamps, and indexing mechanisms for secure machining.
4. Design drill jigs with appropriate drill bushes for specific components.
5. Design and develop fixtures for milling, turning, and boring operations.
6. Identify tool wear types (adhesion, abrasion, diffusion) to predict tool life.
7. Recognize different forms of wear to determine tool replacement timing.
8. Use tool life criteria and machinability index to optimize machining efficiency.
9. Analyze how tool angles and friction affect cutting forces.
10. Consider cost analysis and friction impact when selecting cutting tool materials.

WT-611:B1:- Industrial Hydraulics And Pneumatics-Ii

1. Maintain and operate pneumatic cylinders and motors.
2. Diagnose and repair single-acting and double-acting hydraulic cylinders.
3. Apply telescopic or tandem cylinders for specific reach or force requirements.
4. Select hydraulic cylinders based on specifications and cushioning needs.
5. Size and choose actuators considering force, stroke, speed, and application.
6. Troubleshoot and maintain components in hydraulic systems.
7. Diagnose and repair components in pneumatic systems.
8. Perform routine maintenance on hydraulic and pneumatic systems.
9. Solve problems in fluid power systems using troubleshooting techniques.
10. Identify hydraulic and pneumatic applications in various industries.

WT -622: Practical Based on WT 612

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

WT -612:A2:- Quality Engineering & Industrial Management II

1. Implement process control using statistical methods like control charts.
2. Track customer satisfaction and identify internal customer conflicts.
3. Utilize benchmarking to compare your processes against industry leaders.
4. Form quality circles to empower employees in quality improvement.
5. Apply the seven tools of TQM for data analysis and problem-solving.
6. Standardize processes to ensure consistent quality output.
7. Implement a system for variety control to reduce unnecessary product variations.
8. Explore value engineering techniques to optimize product design and cost.
9. Consider ISO 9000 certification to demonstrate your commitment to quality standards.
10. Understand the benefits and costs associated with ISO 9000 implementation.

WT -612:B2:-Disaster Management-2

1. Monitor weather, geological activity, and potential hazards.
2. Identify areas at risk for flooding, landslides, etc.
3. Analyze data from satellites and remote sources.
4. Follow weather alerts, advisories, and reliable media reports.
5. Join drills, training sessions, and evacuation planning.
6. Learn about common hazards and their potential impacts.
7. Implement mitigation strategies (reinforce structures, create escape plans).
8. Share local knowledge with disaster management officials.
9. Consider structural mitigation options (if applicable).
10. Implement preparedness plans, stockpile supplies, or secure loose objects.

WT-613:A1:- Mechatronics II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

Mechatronics-II is an advanced course that builds on the principles of Mechatronics, combining mechanical engineering, electronics, and computer science. This course covers essential topics related to sensors, transducers, electrical actuation systems, microprocessors, microcontrollers, and motor control relays. It aims to equip students with a deep understanding of Mechatronics systems and their applications in various industries.

Course Objectives:

1. To introduce the concept of Mechatronics and its role in modern engineering systems.
2. To explore various sensors and transducers used for measuring physical quantities.
3. To provide insights into electrical actuation systems, including switches, solenoids, and motors.
4. To familiarize students with microprocessors and microcontrollers, their architecture, and applications.
5. To enable students to understand motor control relays, interfacing sensors, and display devices in Mechatronics systems.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Define Mechatronics and identify its components, including measurement and control systems.
2. Analyze different sensors and transducers and their performance parameters.
3. Understand electrical actuation systems and their applications in Mechatronics devices.
4. Comprehend the architecture and features of microprocessors and microcontrollers.
5. Demonstrate practical skills in motor control, sensor interfacing, and display device integration.
6. Apply Mechatronics principles to real-world engineering problems and projects.

Syllabus

Unit 1: Introduction to 8085 Microprocessor **(6 Hrs)**

- Introduction , Features of 8085 Microprocessor
- Architecture of 8085 **a)** Registers **b)** ALU
- **c)** Address Buffers) Address / Data Buffer) **d)**Interrupt control
- **f)** Timing & control circuitry , **g)** Pin connection of 8085

Unit 2: The 8051 microcontrollers **(5 Hrs)**

- Block Diagram , Over View of 8051 microcontrollers family
- Connection of 8051 Microcontrollers, Input output port

Unit 3: Sensors and transducers **(8 Hrs)**

- Introduction Sensors and transducers.
- Temperature Sensor, Light Sensor, Selection of sensor.
- Performance terminology.
- Displacement, position and proximity.
- Velocity and motion. Force, Fluid Pressure ,Liquid Flow , Liquid Level.

Unit 4: Electrical actuation systems **(6 Hrs)**

- Electrical systems.Mechanical switches, Solid- state switches.
- Solenoids, D.C.motors, A.C. Motors, Stepper motors.

Unit 5: Motor control Relay **(5 Hrs)**

- LCD Display , LED Seven segment display
- Interfacing of Sensors
- Controller and display device

Reference Books

1. "Microprocessor Technique" - By Atul P. Godse&Deepali A Godse
2. "Mechatronics" - By W.Bolten
3. "The 8051 Micro controller Embedded System" - By M.A. Mazidi

WT-613:B1:- Product Design And Development II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

Product Design and Development-2 is a course that focuses on advanced principles and techniques in the field of product design and development. This course extends the fundamental concepts from Product Design and Development-1 and delves deeper into various aspects of the product life-cycle. Students will learn about reverse engineering, bench-marking, and the importance of design for manufacturability, assembly, and sustainability.

Course Objectives:

1. Explore advanced aspects of product design and development.
2. Understand the challenges in commercializing products.
3. Recognize the significance of reverse engineering in product development.
4. Focus on designing products that are easy to manufacture and assemble.
5. Develop skills in creating design validation plans and utilizing PLM and PDM tools.

Course Outcomes:

1. Ability to design sustainable products with a focus on environmental responsibility.
2. Proficiency in developing commercially viable products.
3. Mastery of advanced techniques in PLM and PDM for efficient product development.
4. Skills in reverse engineering and bench-marking for product improvement.
5. Capability to design products with manufacturability, assembly, and sustainability in mind.
6. Profound understanding of the product development life-cycle, including the use of PLM and PDM tools.

Syllabus

Unit 1: Reverse Engineering (10 hours)

- Product Tear-down Process, Tear Down Methods, Force Flow Diagrams, Measurement and Experimentation,
- Applications of Product Tear down, Bench-marking Approach and Detailed Procedure,
- Tools Used In Bench-marking -Indented Assembly Cost Analysis , Function -Form Diagrams,
- Trend Analysis, Setting Product Specifications, Introduction to Product Portfolio and Architecture.

Unit 2: Design for X (10 hours)

- Design for manufacture, Design for assembly, Design for robustness, Design for safety, Design for reliability,
- Design for environment, Design for piece part production, manufacturing cost analysis.
- Local, Regional and Global issues, basic life cycle assessment - basic method, weighed sum assessment method

Unit 3: Product Life Cycle Management and Product Data Management (10 hours)

- Introduction ,Concept of Product Life Cycle management, Components/Elements of PLM,
- Customer Involvement,
- Product Data and Product Workflow,
- The Link Between Product Data and Product Workflow,
- Different Phases of Product Life Cycle and corresponding technology.
- Case study based for design and development of any mechanical product.

Reference Books:

1. "Product Design and Manufacturing" by K. Chitale and R.C. Gupta
2. "Product Design: Techniques in Reverse Engineering and New Product Development" by Kevin Otto and Kristin Wood
3. "Product Lifecycle Management" by Michael Grieves

WT -614:A2:-Robotics II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

Robotics-II is an advanced course that delves into the world of robotics, focusing on topics such as robot sensors, vision systems, programming languages, and their practical applications in various industries. This course provides students with an in-depth understanding of the technologies that make robots intelligent, capable of sensing their surroundings, and performing tasks in industrial settings.

Course Objectives:

1. To introduce the importance of sensors in robotics and understand their role in robot perception and interaction with the environment.
2. To explore various types of sensors used in robotics and their working principles.
3. To discuss the need for vision systems in robotics, including image acquisition, illumination techniques, and image conversion.
4. To introduce students to robot programming languages and methods for controlling robotic systems.
5. To provide insights into the industrial applications of robots, including material transfer, welding, assembly, and inspection.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Explain the significance of sensors in robotics and their relevance to real-world applications.
2. Identify and classify different types of sensors based on their working principles.
3. Demonstrate an understanding of robot vision systems, including image acquisition and processing.
4. Comprehend the basics of robot programming languages and how artificial intelligence plays a role in robot control.
5. Analyze and evaluate the use of robots in various industrial applications, such as material handling, welding, and assembly.

Syllabus

Unit 1:-Robot Sensor **(12 Hrs)**

- Types of sensor based on working principal.
- Type of sensor- Range sensor, Proximity sensor, Touch sensor.Need of sensor in robotic system.
- Various sensing device used in robot. Work cell.
- Sensor characteristics.Selection of sensor& uses in Robotics

Unit 1:-Robot Vision System **(6 Hrs)**

- Need of vision system in robotics.Image acquisition.
- Illumination technique.Image conversion.Camera sensor.

Unit 1:-Robot Programming Language **(6 Hrs)**

- Methods of Robot programming. Robot programming language.
- Artificial intelligence's in robot.

Unit 1:- Robot Application in Manufacturing **(6 Hrs)**

- General consideration in robot material handling. Material transfer application.
- Machine loading and unloading.Spot Welding & Continuous Arc Welding.
- Spray Coating.Assembly& Inspection

Reference Books:

1. "Industrial Robotics: Technology, Programming, and Applications" by M.P. Groover, M. Weiss, R.N. Nagel, N.G. Odrey
2. "Robotics Technology and Flexible Automation" by S.R. Deb
3. "Robotics: Control, Sensing, Vision, and Intelligence" by K.S. Fu, R.C. Gonzalez, and C.S.G. Lee

WT -614:B2:-Computer Integrated Manufacturing

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

Computer Integrated Manufacturing (CIM) is a comprehensive course designed to provide students with a deep understanding of modern manufacturing systems. The course covers various aspects of CIM, including its introduction, elements, benefits, and applications. It also delves into the crucial topics of Numerical Control (NC), Computer Numerical Control (CNC) systems, and Computer Aided Process Planning (CAPP).

Course Objectives:

1. To introduce students to the concept of Computer Integrated Manufacturing (CIM) and the sequence of functions .
2. To provide an understanding of the elements of a CIM system and its advantages.
3. To explore the various applications of CIM systems in the manufacturing industry.
4. To familiarize students with NC, CNC, and DNC systems, along with their components and advantages.
5. To enable students to grasp the principles of CNC machining, including coordinate systems and motion control.

Course Outcomes:

1. Students will develop a comprehensive understanding of Computer Integrated Manufacturing (CIM).
2. Students will be able to identify and explain the key elements of a CIM system.
3. Students will gain proficiency in the principles and applications of NC, CNC systems, and DNC systems.
4. Students will appreciate the importance of rationalizing manufacturing processes within the framework of CIM.
5. Students will comprehend the role of Computer Aided Process Planning (CAPP) in modern manufacturing.

Syllabus

Unit 1:Computer Integrated Manufacturing System (8 Hrs)

- Introduction to Computer Integrated Manufacturing, Integration and Rationalization in CIM
- Sequence of Functions in CIM, Elements of a CIM System, The CIM Wheel, Benefits of CIM
- Applications of CIM System

Unit 2:NC/CNC/DNC Systems (13 Hrs)

- Introduction to CNC Systems, Basic Components of CNC Systems
- Understanding the NC Coordinate System, Types of NC Motion Control Systems
- Comparison Between NC and Conventional Machine Tools
- Basic Principles of NC Machines and Their Advantages, CNC Words and G&M Codes
- Introduction to Machining Centers: Functions, Types, Advantages, Disadvantages, and Applications
- Tooling Requirements, Basics of CNC & DNC: Functions, Advantages, and Disadvantages

Unit 3:Computer Aided Process Planning (CAPP) (9 Hrs)

- Role of Process Planning
- Approach to Process Planning
- Process Planning System
- Benefits of CAPP
- Advantages of CAPP in Modern Manufacturing

Reference Books:

1. "Computer Aided Design and Manufacturing" by Groover, M. P., Prentice-Hall of India, 5th Edition, 2005.
2. "Automation Production Systems and Computer Integrated Manufacturing" by Groover, M. P., Prentice-Hall of India, 2nd Edition.
3. "CAD/CAM" by Zeid Ibrahim, Tata McGraw Hill, 1st revised edition, 2006.
4. "Robot System and Analysis" by Shah S.K., Tata McGraw Hill, 1st edition, 2008.

WT -523: Practical Based on WT 613

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

WT-613:A1:- Mechatronics-II

1. Measurement of Displacement Using LVDT
2. Measurement of Distance Using LDR
3. Measurement of Temperature Using RTD
4. Measurement of Temperature Using Thermocouple
5. Measurement of Weight Using Strain Gauge
6. Measurement of Temperature Using Thermister
7. Measurement of Pressure Using Piezoelectric Pick Up
8. Measurement of Speed of D.C. Motor By Photoelectric Pick Up
9. Study of architecture of Microprocessor 8085
10. Introduction To 8051 Microcontroller

WT-613:B1:- Product Design And Development II

1. Disassemble a product to understand its construction (tear-down process).
2. Use force flow diagrams to map product assembly sequences.
3. Measure components and experiment to learn material properties and functionalities.
4. Benchmark competitor products to identify strengths and weaknesses.
5. Analyze assembly costs using indented assembly cost analysis tools.
6. Create function-form diagrams to map product functions to their physical forms.
7. Consider factors like manufacturability, assembly ease, safety, reliability, and environment during design.
8. Analyze production costs to optimize designs for affordability.
9. Implement life cycle assessment to minimize environmental impact of your product.
10. Manage product data throughout its lifecycle using product data management systems.

WT -524: Practical Based on WT 614

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

WT -614:A2:-Robotics II

1. Study of sensor integration.
2. Study of robot vision system
3. Study of Range sensor
4. Study of programming language
5. Study of Image conversion & Camera sensor
6. Study of Artificial intelligence's in robot
7. Study of industrial application of robot
8. Study of Assembly& Inspection
9. Study of Spot Welding & Continuous Arc Welding
10. Study of Spray Coating

WT -614:B2:-Computer Integrated Manufacturing

1. Integrate different manufacturing functions (planning, scheduling, production) using CIM.
2. Analyze the sequence of steps within a CIM system to optimize workflow.
3. Identify key CIM system components like computers, software, and networks.
4. Research real-world examples of CIM implementation in various industries.
5. Understand the basic components of a CNC machine (controller, motors, drives).
6. Learn the NC coordinate system (X, Y, Z) for programming tool movements.
7. Compare capabilities and benefits of NC vs. conventional machines.
8. Master basic principles of NC machining for automated production.
9. Learn common CNC G&M codes for programming tool paths and functions.
10. Recognize the role of CAPP software in defining efficient manufacturing steps.

WT-615:A1:- Advance Manufacturing Processes II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

This course delves into advanced manufacturing processes, including non-conventional machining methods, computer numerical control (CNC) systems, and advanced welding techniques. It provides students with the knowledge and skills to understand and apply these innovative techniques in modern manufacturing. This course equips students with the knowledge and skills needed to leverage advanced manufacturing methods and technologies, making them valuable contributors in modern manufacturing industries.

Course Objectives:

1. To introduce students to non-conventional machining processes and their advantages and applications.
2. To familiarize students with CNC systems, G&M codes, and the basics of machining centers.
3. To provide an understanding of advanced welding techniques, including laser and electron beam welding.
4. To emphasize the importance of quality control and standards in advanced welding processes.
5. To enable students to analyze case studies and real-world applications of advanced manufacturing methods.

Course Outcomes:

Upon completing this course, students will be able to:

1. Differentiate between conventional and non-conventional machining processes and describe their working principles.
2. Identify and explain the advantages, disadvantages, and applications of non-conventional machining techniques.
3. Understand the components and operation of CNC systems, including G&M codes and machining centers.
4. Evaluate the significance of advanced welding techniques and their applications in industries.
5. Demonstrate an understanding of quality control measures, welding codes, and standards in advanced welding.

Syllabus

Unit 1: Non-Conventional Machining Processes **(8 Hrs)**

- Non-Conventional Machining Overview, Comparison with traditional machining, Types and working principles
- Electrochemical Machining(ECM) :- working, advantages, disadvantages, and applications.
- Electrical Discharge Machining(EDM) :- working, advantages, disadvantages, and applications.
- Abrasive Jet Machining(AJM) :- working, advantages, disadvantages, and applications.
- Laser Beam Machining(LBM) :- working, advantages, disadvantages, and applications.
- Electron Beam Machining (EBM):-working, advantages, disadvantages, and applications.
- Ion Beam Machining (IBM):- working, advantages, disadvantages, and applications.

Unit 2: NC/CNC/DNC Systems **(12 Hrs)**

- Computer Numerical Control (CNC) Systems, Introduction to NC, CNC, DNC Machines, Basic components of CNC systems
- Understanding the NC coordinate system, Types of NC motion control systems
- Comparison between NC and Conventional Machine Tools, Basic Principles of NC Machines, its Advantages
- NC words, G&M codes, Introduction to Machining Centers: functions, types, advantages, disadvantages & applications.
- Tooling Requirements, Basics of CNC & DNC: functions, advantages, and disadvantages.

Unit 3: Advanced Welding Processes **(10 Hrs)**

- Advanced Welding Techniques: Laser and Electron Beam Welding, Welding Joints and Positions for Advanced Welding
- Weld Defects, Inspection, and Quality Control in Advanced Welding, Advances in Welding Technology and Innovations
- Welding Codes and Standards for Advanced Welding, Case Studies in Advanced Welding

- Advanced Welding in the Automotive and Aerospace Industries

Text Books

1. Workshop Technology : Chapman, Vols.
2. Manufacturing Process : Hazra Chowdhary, Vol. 2.
3. Computer aided design & manufacturing by Zimmer & Groover
4. CAD Principles & Applications by PAUL C Bave

Reference Books

1. "Advanced Welding Processes"John Norrish,Woodhead Publishing,2006
2. Begeman: Manufacturing Processes.
3. Numerical control & computer aided by T.K. Kundra
4. CNC Machines by Pabla

WT-615:B1:-Engineering Economics And Financial Management II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description

"Engineering Economics and Financial Management" is a fundamental course that equips students with knowledge of financial and economic principles essential in an engineering context. The course covers various aspects of finance, including money classification, taxation, insurance, depreciation, cost analysis, and record-keeping. It delves into cost accounting, offering insights into standard costs, fixed and variable costs, as well as cost allocation methods.

Course Objectives:-

1. The student shall be able to understand the various financial and economical terms use in industry.
2. The students shall be able to understand classification of money, taxation and different types of insurance.
3. Students shall be able to know about depreciation.
4. The students shall be able to understand cost analysis.
5. Students shall be able to keeping record and cost estimation.

Course Outcomes:-

1. Students are able to deal with different financial and economical terms used in industry.
2. Students are capable to understand money exchange, different types of tax and insurance.
3. Capable to classify different types of costing methods.
4. Students are able to keep financial record

Syllabus

Unit 1: Costs and Cost Accounting **(8 Hrs)**

- Standard cost, estimated cost, First cost, Fixed cost, Variable cost, Incremental cost, Differential cost, Sunk and marginal cost,
- Break-even and minimum cost analysis. Objectives of cost accounting, elements of cost: material cost,
- labor cost, and expenses, allocation of overheads by different methods, Numerical problems.

Unit 1: Basis for Comparison of alternatives **(8 Hrs)**

- Present worth, equivalent annual worth, future worth, rate of return, payback period,
- capitalized cost comparison, and capital recovery with return methods, Numerical problems.
- Replacement analysis: Basic reasons for replacement, present asset and its replacement,
- consideration leading to replacement, installation and removal cost, Numerical problems.

Unit 1: Book Keeping ,accounts and cost estimation **(14 Hrs)**

- Introduction, Necessity of book keeping, single entry and double entry system, Classification of assets, Journal, Ledger,
- Trial balance, Final accounts, trading, profit and loss account, Balance sheet, Numerical problems.
- Introduction, importance, objectives and functions of estimating, principle factors in estimating, Functions and qualities of an estimator, estimating procedure.
- Estimation of material cost and manufacturing cost of simple automotive components,
- Estimation of cost of overhauling and servicing of automotive components - cylinder, valves, valve seats,
- crankshaft, FIP, Brake drum, body building, different types of repairs, Numerical problems.

Reference Books:

1. Engineering Economics, Tara Chand, Nem Chand and Brothers, Roorkee
2. Engineering Economy, Thuesen, G. J. and Fabrycky, W. J., Prentice Hall of India Pvt. Ltd.
3. Mechanical Estimating and Costing, T. R. Banga and S. C. Sharma, Khanna Publishers, Delhi
4. Industrial Organization and Engineering Economics, T. R. Banga and S. C. Sharma, Khanna Publishers, New Delhi

5. Mechanical Estimating and Costing, D. Kannappan et al., Tata McGraw Hill Publishing Company Ltd., New Delhi
6. A Text Book of Mechanical Estimating and Costing, O. P. Khanna, Dhanpat Rai Publications Pvt. Ltd., New Delhi
7. Industrial Engineering and Management, O. P. Khanna, Dhanpat Rai and Sons, New Delhi
8. Financial Management, I. M. Pandey, Vikas Publishing House Pvt. Ltd., New Delhi
9. Engineering Economics, James L. Riggs, David D. Bedworth and Sabah U. Randhawa, Tata McGrawHill Publishing Co. Ltd., New Delhi
10. Engineering Economy, Paul DeGarmo, Macmillan International Inc., New York

WT -616:A2:-Industrial Engineering II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

Industrial Engineering-2 is an advanced course focusing on work measurement techniques, including time study, work sampling, and advanced methods like Predetermined Motion Time Standards (PMTS). The course also delves into continuous improvement methodologies such as Kaizen and the application of work study principles in both manufacturing and service sectors.This course equips students with the knowledge and skills required to measure and optimize work processes accurately, promoting efficiency and continuous improvement in various sectors.

Course Objectives:

By the end of the course, students will be able to:

1. Understand and apply various work measurement techniques, including time study, work sampling, and PMTS.
2. Analyze and establish time standards using modern methods like Methods Time Measurement (MTM).
3. Comprehend the principles of Kaizen and its role in achieving continuous improvement.
4. Identify the scope and objectives of the JIT (Just-In-Time) system, including its application in the Toyota production system.
5. Apply work study concepts to real-world case studies and analyze their impact on manufacturing and service sectors.

Course Outcomes:

Upon completing the course, students will be able to:

1. Apply time study techniques to measure and analyze work processes, leading to the establishment of time standards.
2. Utilize work sampling to determine random observations, establish confidence levels, and make informed decisions about work .
3. Implement advanced work measurement techniques, including PMTS, for precise time standards.
4. Understand the principles of Kaizen and its application in achieving continuous process improvement.
5. Apply the PDCA (Plan-Do-Check-Act) cycle to enhance efficiency and quality through Kaizen.

Syllabus

Unit 1: Work Measurement : **(8 Hrs)**

- Techniques, Purpose, Use, Basic Procedure of time study, Time study equipment,
- Selection of job for time study, Approach to worker, Steps in Time study,
- Data collection about job. Video Time Study – Elemental breakdown of tasks,

Unit 2: Work Measurement Techniques : **(6 Hrs)**

- Work Sampling, Need, Establishing confidence level, Determination of sample size, Applications, Advantages.
- Random Observation, Conduct of study, Use of Work sampling, Introduction of business process re-engineering. Steps Involved,

Unit 3: Advance work measurement techniques : **(8 Hrs)**

- Predetermined Motion Time Standards – Introduction. Methods Time Measurement
- Establishing Time Standards using MTM. Introduction to MOST - Basic, Mini and Maxi MOST, General Move,
- Control Move, Tool Sequence. Application of Work Study in Manufacturing and Service sector,
- Case studies and Analysis Estimation of Standard Time using MTM

Unit 4: Kaizen : **(8 Hrs)**

- Continues method improvement, Kaizen concept, Kaizen umbrella for quality improvement, Kaizen and management,
- Kaizen & TQC, PDCA cycle, SMED-Single Minute Exchange of Die-Introduction, JIT system-Concept, scope & objectives,

- Toyota production system.

Reference Books:

1. "Most Work Measurement Systems" by K.B. Zandin.
2. "Introduction to Work Study" by ILO.
3. "Motion & Time Study Design & Measurement of Work" by Ralph Barnes (Wiley Eastern).
4. "Work Study" by R.M. Currie & J. Faraday.
5. "Kaizen" by Shyam Talwadekar.
6. "Kaizen" by Masaki Imai and "SMED" by Shino Shingo.
7. "Just-In-Time: Making it Happen" by J. L. Mangan, Richard B. Lamb, and L. M. Varela.

WT -616:B2:- Automation And Control Engineering II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Description:

The course is a comprehensive program designed to introduce students to the principles, technologies, and practices of automation and control systems in various industries. The course covers topics such as sensors, actuators, control systems, PLC programming, HMI, SCADA, industrial communication, and cybersecurity. It emphasizes real-world applications and hands-on experience with modern automation technologies.

Course Objectives:

1. Understand the fundamental concepts and significance of automation and control in industrial processes and systems.
2. Master the principles of control systems, including feedback control, stability, and Laplace transforms.
3. Gain proficiency in programming and implementing Programmable Logic Controllers (PLCs) for industrial automation.
4. Develop skills in designing Human-Machine Interface (HMI) systems and utilizing SCADA for process control.
5. Familiarize themselves with industrial communication protocols, networking, and cybersecurity in automation.

Course Outcomes:

By the end of the course, students will be able to:

1. Describe the key components and functions of automation and control systems.
2. Analyze and design control systems, considering aspects such as feedback, stability, and transfer functions.
3. Program and implement PLCs to control industrial processes, troubleshooting and optimizing these systems.
4. Develop and interface with Human-Machine Interface (HMI) systems and create functional SCADA applications .
5. Evaluate industrial communication protocols, design networked automation systems, and address cybersecurity challenges.

Syllabus

Unit 1: Programmable Logic Controllers (PLCs) (10 Hrs)

- Role of PLCs in Industrial Automation,Key applications and advantages of using PLCs.
- PLC Programming Basics. Overview of the IEC 61131-3 standard for PLC programming.
- PLC Hardware Components and Interfaces. Interfacing PLCs with sensors, actuators, and other devices.
- PLC Applications in Automation

Unit 2: Human-Machine Interface (HMI) and SCADA (10 Hrs)

- Introduction to HMI and SCADA Systems. Comparative analysis of HMI and SCADA systems.
- Design and Development of HMI Interfacest. Creating user-friendly HMI interfaces for process control.
- SCADA Systems and Supervisory Control . Case studies demonstrating the use of SCADA in various industries.
- Remote Monitoring and Control Using SCADA. Practical exercises in SCADA system configuration and operation.

Unit 3: Industrial Communication and Cybersecurity (10 Hrs)

- Communication Protocols in Industrial Automation. Selection of the appropriate protocol for specific applications.
- Networking in Automation:. Designing and configuring industrial networks.
- Wireless Communication in Industrial Automation. Implementing wireless communication solutions.
- Cybersecurity in Industrial Automation. Strategies and best practices for securing automation systems.
- Interfacing with IoT (Internet of Things). Hands-on IoT integration projects and practical applications.

Reference Books:

1. "Industrial Automation and Process Control" by Jon Stenerson and Randal Wilson.
2. "PLC Programming using RSLogix 500: Basic Concepts of Ladder Logic Programming!" by Gary D. Anderson.
3. "Automation, Production Systems, and Computer-Integrated Manufacturing" by Mikell P. Groover and Anil K. Chitkara.

4. "Programmable Logic Controllers: Industrial Control" by K. Shibu.
5. "Introduction to Industrial Automation" by K.A. Cole, Kelly Johnson, and R. Joe Hunt.

WT -525: Practical Based on WT 615

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

. **WT-615:A1:- Advance Manufacturing Processes II**

1. Choose non-conventional machining for precise work on conductive materials (ECM).
2. Utilize EDM for complex shapes and machining hard materials.
3. Employ Abrasive Jet Machining for cleaning, cutting, and deburring delicate parts.
4. Leverage Laser Beam Machining for high-precision cutting, welding, and drilling.
5. Operate CNC machines for automated machining using their components and functionalities.
6. Program precise tool movements in CNC machining using the NC coordinate system (X, Y, Z).
7. Utilize CNC for higher production efficiency compared to conventional machines.
8. Master common G&M codes for CNC programming to control tool paths and functions.
9. Select appropriate tooling for effective CNC machining operations.
10. Inspect welds for defects using proper techniques to ensure quality in advanced welding processes.

WT-615:B1:-Engineering Economics And Financial Management II

1. Differentiate fixed costs (rent) from variable costs (materials used) for better cost analysis.
2. Calculate the "break-even point" to know how much you need to produce to turn a profit.
3. Allocate overhead costs (utilities) fairly across different products using appropriate methods.
4. Choose between investment options by comparing present worth, future worth, or payback period.
5. Analyze costs and benefits to decide when to replace aging equipment.
6. Select single or double entry bookkeeping based on your business needs.
7. Prepare key financial statements like a trial balance and income statement.
8. Estimate the material cost required for a product based on its design.
9. Estimate manufacturing costs considering labor, overhead, and other production expenses.
10. Practice estimating costs for repairs and servicing specific automotive components.

WT -526: Practical Based on WT 616

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

WT -616:A2:-Industrial Engineering II

1. Analyze tasks and set time standards using time study methods.
2. Break down complex tasks into elements for video time study analysis.
3. Conduct random observations to estimate activity time distribution (work sampling).
4. Identify improvement opportunities based on work sampling data.
5. Set work time standards using predetermined motion time values (MTM).
6. Estimate work times by analyzing tasks with Maynard Operation Sequence Technique (MOST).
7. Implement small, ongoing process improvements following Kaizen principles.
8. Utilize the Plan-Do-Check-Act (PDCA) cycle for structured problem-solving and improvement.
9. Reduce changeover times in production runs using Single Minute Exchange of Die (SMED).
10. Understand Just-in-Time (JIT) principles for minimizing waste and improving efficiency.

WT -616:B2:- Automation And Control Engineering Ii

1. Automate industrial tasks and equipment using Programmable Logic Controllers (PLCs).
2. Program PLCs following IEC 61131-3 programming standards.
3. Interface PLCs with sensors, actuators, and other industrial devices for data exchange.
4. Design user-friendly HMI screens for process monitoring and operator control.
5. Implement SCADA systems for supervisory control and centralized management.
6. Monitor and control industrial processes remotely using SCADA technology.
7. Choose appropriate communication protocols for data exchange in automation systems.
8. Design and configure robust industrial networks for reliable communication.
9. Implement cyber security measures to protect industrial automation systems from threats.
10. Explore integration possibilities between Industrial Automation and Internet of Things (IoT) devices.

WT-517: SEC (G) Creative Abilities

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 CA	

Objectives

- Enhance workplace ethics and atmosphere through training and motivation.
- Master innovative idea conceptualization using five key dimensions.
- Develop proficiency in problem-solving for generating and growing business ideas.

Outcomes

- Enhancing ethics and work environment through training and motivation.
- Mastering five dimensions for successful innovation.
- Proficiency in problem-solving for business idea creation and growth.

Syllabus

Unit I Boosting Morale (7 Hrs)

Boosting ethics & Development work environment, ethics theory, Development of work environment & training process, knowledge of presentation & self motivation.

Unit II Innovative Dimensions: (12 Hrs)

Five Dimensions to conceptualize your idea to make it a successful innovation. When conceptualizing an idea, it is essential to ask questions like what is the problem that the idea solves, who is the consumer for the idea, does the idea solve the consumer's problems and how will the solution be delivered to the consumer. It is very important to direct the thinking to specific dimensions and search answers to certain questions that help in evolving the idea from the initial thought through the various stages of innovation.

Unit III Business Idea Generation and Growth (9 Hrs)

The single most effective way to come up with a business idea is to solve a problem. Next step, you bring the idea to life. Whether it's code, carpentry, or culinary, a project is a created idea. When the project is nearly complete and it's time to begin putting the project into the hands of real people. Once your project is perfected through testing, it's time to come up with a way to make money from it. Growth - Get the word out about the thing.

Text Books & References books

1. "Boosting Employee Morale" by Bob Nelson - for Unit I: Boosting Morale.
2. "The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail" by Clayton M. Christensen - for Unit II: Innovative Dimensions.
3. "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses" by Eric Ries - for Unit III: Business Idea Generation and Growth.

WT-517: SEC (G) Digital Skills

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 CA	

Objectives

- Develop effective written communication skills for professional correspondence such as memos and emails.
- Gain proficiency in operating various digital tools and technologies essential for modern workplace environments.
- Understand the importance of information security policies and their implications for safeguarding digital data within organizational boundaries.
- Apply knowledge of communication strategies to effectively communicate with stakeholders including customers, co-workers, and vendors.
- Acquire skills in implementing and adhering to information security policies to ensure compliance and mitigate digital security risks.

Outcomes

- Enhance written communication skills for professional correspondence through memos and emails.
- Master the operation of diverse digital tools and technologies crucial for contemporary workplaces.
- Comprehend the significance of Information Security Policy (ISP) in safeguarding digital data within organizational boundaries.
- Apply communication strategies effectively to communicate work updates and request information from stakeholders.
- Implement information security policies to ensure compliance and mitigate digital security risks within the organization.

Syllabus

Unit I : Communication Strategies (8 Hrs)

Write memos and e-mail to customers, co-workers, and vendors to provide them with work updates and to request appropriate information.

Unit II Digital Tools (12 Hrs)

Operate all types of digital tools like laptops, palmtops, mobiles, fax machines, printers, projectors, conferencing tools effectively. Attributes that feature in the emergence of novel technologies are: (i) radical novelty, (ii) relatively fast growth, (iii) coherence, (iv) prominent impact, and (v) uncertainty and ambiguity. The framework for operationalising emerging technologies is then elaborated on the basis of the proposed attributes.

Unit III : Information Security Policy (10 Hrs)

Understanding and adhering to the Information security aspects of the organization based on ISP. Information Security Policy (ISP) is a set of rules enacted by an organization to ensure that all users or networks of the IT structure within the organization's domain abide by the prescriptions regarding the security of data stored digitally within the boundaries the organization stretches its authority.

Text Books & References Books

1. "Business Communication: Building Critical Skills" by Kitty Locker and Stephen Kyo Kaczmarek – for Communication Strategies.
2. "Digital Literacy For Dummies" by Faithe Wempen - for Digital Tools.
3. "Information Security Management Handbook" by Harold F. Tipton and Micki Krause Nozaki - for Information Security Policy.