D Y PATIL
COLLEGE of
ENGINEERING & TECHNOLOGY
(AN AUTONOMOUS INSTITUTE)
KASABA BAWADA, KOLHAPUR

D Y Patil College of Engineering and Technology,
Kasaba Bawada, Kolhapur
Department of Mechanical Engineering

D. Y. Patil College of Engineering and Technology

Kasaba Bawada, Kolhapur

(An Autonomous Institute)

Accredited by NAAC with 'A' Grade

B. Tech Programme Structure

S.Y. B. Tech.

(Mechanical Engineering)

(To be implemented from academic year **2024-25**)

MECHANICAL ENGG. DEPT. K. BAVADA, KOP.

Professor & Head
Mechanical Engg. Dept.,
D. Y. Patil College of Engg. & Tech.
Kolhapur

D Y PATIL COLLEGE OF ENGINEERING AND TECHNOLOGY, KOLHAPUR

Teaching and Evaluation Scheme from Year 2024-25 (asper NEP-2020)

Second Year B.Tech Mechanical Engineering

SEMESTER -III

Sr. No.	Course Code	Course Type	Course Name	Teaching Scheme				Theory			Practical/ Tutorial		Total Marks
				Credits	Contact Hrs			ISE	MSE	ESE			
					L	P	T				INT	OE/PoE	
01	231MEPCCL201	PCC	Fluid Mechanics and Machineries	3	3	-	-	20	30	50	-	-	100
02	231MEPCCL202	PCC	Kinematics of Mechanism and Machines	2	2	-	-	20	30	50	-	-	100
03	231MEPCCL203	PCC	Manufacturing Processes	3	3	-	-	20	30	50	-	-	100
04	231MECEPP201	CEP	Mini Project Lab	2	1	2	-	-	-	-	25	25	50
05	231MEMDML201	MDM	Management Theory & Organizational Behavior	2	2	-	-	20	-	30	-	-	50
06	231MEVECL201	VEC	Positive Attitude and Behavior	1	1	-	-	-	-	-	25	-	25
07	231MEOECL201	OEC	Human Resource Management	4	4	-	-	20	30	50	25	-	125
08	231MEHSSML201	HSSM	Industrial Management	2	2	-	-	20	-	30	-	-	50
09	231MEPCCP201	PCC	Fluid Mechanics and Machineries Lab	1	-	2	-	-	-	-	25	25	50
10	231MEPCCP202	PCC	Kinematics Mechanism and Machines Lab	1	-	2	-	-	-	-	25	-	25
11	231MEVECP201	VEC	Positive Attitude and Behavior Lab	1	-	2	-	-	-	-	25	-	25
12	231MEMCL201	MC	Finishing School Training III	Audit	3*	-	-	-	-	50	-	-	Grade
13	231MECCAC201	CCA	Liberal Learning	Audit	2*	-	-	-	-	50	-	-	Grade
Total				22	18	08	00	120	120	260	150	50	700

Min. Marks for Passing: 40% of total marks of individual course

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Teaching and Evaluation Scheme from Year 2024-25 (asper NEP-2020)

Second Year B.Tech Mechanical Engineering

SEMESTER -IV

Sr. No.	Course Code	Course Type	Course Name	Teaching Scheme				Theory			Practical/ Tutorial		Total Marks
				Credits	Contact Hrs			ISE	MSE	ESE			
					L	P	T				INT	OE/PoE	
01	231MEPCCL204	PCC	Strength of Materials	2	2	-	-	20	30	50	-	-	100
02	231MEPCCL205	PCC	Dynamics of Machines	3	3	-	-	20	30	50	-	-	100
03	231MEPCCL206	PCC	Machine Tools and Processes	3	3	-	-	20	30	50	-	-	100
04	231MEMDML202	MDM	Entrepreneurship Development & Management	2	2	-	-	20	-	30	-	-	50
05	231MEVECL202	VEC	Environmental Study	2	2	-	-	-	-	50	-	-	50
06	231MEOECL202	OEC	Marketing Management	2	2	-	-	20	-	30	-	-	50
07	231MEHSSML202	HSSM	Operations management	2	2	-	-	20	30	-	-	-	50
08	231MEAECL201	AEC	Basics of Finance	2	2	-	-	20	30	-	-	-	50
09	231MEVSECL201	VSEC	3 D Modelling	1	1	-	-	-	-	-	25	-	25
10	231MEPCCP205	PCC	Dynamics of Machines Lab	1	-	2	-	-	-	-	25	25	50
11	231MEPCCP206	PCC	Machine Tools and Processes Lab	1	-	2	-	-	-	-	25	-	25
12	231MEVSECP201	VSEC	3 D Modelling Lab	1	-	2	-	-	-	-	-	25	25
13	231MEMCL202	MC	Finishing School Training IV	Audit	2*	-	-	-	-	50	-	-	Grade
14	231MECCA202	CCA	Liberal Learning	Audit	2*	-	-	-	-	50	-	-	Grade
Total				22	19	06	00	140	150	260	75	50	675

Min. Marks for Passing: 40% of total marks of individual course

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Teaching and Evaluation Scheme from Year 2024-25 (asper NEP-2020)

Second Year B.Tech Mechanical Engineering

INDUSTRIAL AUTOMATION AND ROBOTICS (HONOURS)

SEMESTER -IV

Sr. No.	Course Code	Course Type	Course Name	Teaching Scheme				Theory			Practical/ Tutorial		Total Marks
				Credits	Contact Hrs			ISE	MSE	ESE			
					L	P	T				INT	OE/PoE	
01	231MEHCL201	HC	Fundamentals of Robotics	3	3	-	-	20	30	50	-	-	100
02	231MEHCP201	HC	Fundamentals of Robotics Lab	1	-	2	-	-	-	-	25	-	25
Total				04	03	02	00	20	30	50	25	00	125

Min. Marks for Passing: 40% of total marks of individual course

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B. Tech Second Year (Mechanical Engineering)
Semester: III
Subject: Fluid Mechanics and Machineries
Course Code: 231MEPCCL201

Course Plan

Course Title : Fluid Mechanics and Machineries	
Course Code : 231MEPCCL201	**Semester : III**
Teaching Scheme : L-T-P : 3 - 0 - 0	Credits : 3
Evaluation Scheme : ISE : 20 MSE Marks : 30	ESE Marks : **50**

Prerequisite: Applied Physics, Applied Chemistry

Course Description:

Fluid Mechanics is a fundamental branch of physics and engineering that explores the behavior of fluids (liquids and gases) and their interactions with solid bodies. This course provides students with a comprehensive understanding of the principles governing fluid flow, fluid statics, and fluid dynamics. Through theoretical study, problem-solving exercises, and laboratory experiments, students will develop the skills necessary to analyze and predict the behavior of fluids in various engineering and scientific applications.

Course Objectives:

1	To study the physical significance of fluid kinematics, fluid dynamics and its applications.
2	To understand the different form of governing equation related to fluid flow.
3	To analyze and evaluate fluid mechanics systems by applying principles of Physics, mathematics, science and engineering.
4	To develop skills in the analysis of fluid systems for lifelong learning
5	To understand the working principles of Impulse and Reaction water turbines also to study its velocity triangles & design parameters related to Turbines

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Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Identify the fluid flow problem and explain the theoretical concepts of fluid kinematics and fluid dynamics.	L2
2	Apply governing equation of fluid mechanics i.e. Continuity equation, Bernoulli's Equation and momentum equation for different fluid flow applications.	L3
3	Apply momentum equation and make basic analysis of laminar flow to calculate the energy losses.	L3
4	Analyze the energy losses in fluid flow systems.	L4
5	Apply theory of boundary layer, Drag and lift forces in proper cases	L3
6	Understand & Apply working principle of Rotodynamic machines	L3

Content	Hours
Unit 1 : Fluid Kinematics	6
Continuity equation, Continuity equation in Cartesian coordinates in three dimensional forms. Velocity and Acceleration of fluid particles, Stream function and velocity potential function, Eulerian and Lagrangian approach of fluid flow.	
Unit 2 : Governing Equations in Fluid Dynamics	8
Equations of Motion, Euler's Equation of motion, Integration of Euler's equation to obtain Bernoulli's equation, Bernoulli's Theorem, Applications of Bernoulli's theorem such as Venturimeter, orifice meter and Pitot tube, Kinetic Energy correction factor, Notch, Derivation of Flow over triangular and rectangular notches only, Orifice and its classification, Introduction of CFD & its applications.	
Unit 3 : Momentum Equation and Laminar Flow	8
I. Momentum Equation: Derivation of momentum equation, Applications of momentum equation, momentum correction factor, Analysis of fluid flow through pipe bends.	

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II. Laminar Flow: Laminar flow through circular pipes, derivation of Hagen Poiseuille's equation and Laminar flow through parallel plates, Reynolds's Transport Theorem	
Unit 4 : Flow Through Pipes and Boundary Layer Theory	
I. Flow Through Pipes: Different energy losses in flow through pipe, Losses due to friction: Darcy's Welsbach equation and Chezy's equation, Minor Losses due to expansion, contraction, pipe fittings, at entrance, at exit, due to obstruction etc. Flow through Series pipe, Parallel pipe, Siphon pipes, Branching pipes and equivalent pipes, Hydraulic Gradient line (HGL) and Total Energy Line (TEL) II. Boundary Layer Theory: Boundary layer thickness, its characteristics, laminar and turbulent boundary layers, Displacement thickness, Momentum thickness, Energy thickness, separation, boundary layer control, Introduction to Compressible flow.	8
Unit 5 : Impulse Water Turbines	
Euler's equation for work done in Rotodyanamic Machines, classification of water turbines, Pelton wheel, its construction and working, velocity triangles, types. Pelton wheel design (bucket dimensions, Number of buckets, Jet diameter, Wheel diameter, Jet ratio, Speed ratio, Number of jets), Calculation of efficiency, Power, Discharge etc. Governing of Pelton wheel. Study and demonstration of Model & Testing, Unit quantities of Impulse Water turbine	6
Unit 6 : Reaction Water Turbines	
Principle of operation, Construction and working of Francis and Kaplan Turbine, Draft tube, Cavitation calculation of various efficiencies, Power, Discharge, Blade angles, Runner dimensions etc. Governing of Francis and Kaplan turbine. Draft tube-types and analysis. Study and demonstration of Model & Testing, Unit quantities of Reaction Water turbine	6

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Textbook:

1 "Fluid Mechanics", R. K. Bansal, Laxmi publications. New Delhi, 2018.

2 "Fluid mechanics and Hydraulic Machines", Modi and Seth, 22nd Edition2018.

Reference Books:

1. "Fluid Mechanics", V.L. Streeter and E.B. Wylie, Tata McGraw Hill Pvt. Ltd., New Delhi, 2017.

2. "Mechanics of Fluid", Merle C. Potter, Prentis Hallof India, New Delhi, 2nd Edition.

3. "Fluid Mechanics", Fox and McDonald, John Wiley and Sons, New York, 8th Edition.

4. "Fundamentals of Fluid Mechanics", B.R. Munson, D.F. Young, T. H. Okiishi Wiley India Pvt. Ltd.

5. "Fluid Mechanics and Machinery", C.S. Ojha, , Oxford University Press.

Online Resources:

Unit No	Online Resource Link	Source
1	**https://nptel.ac.in/courses/112105287**	**NPTEL**
2	**https://nptel.ac.in/courses/105103192**	**NPTEL**
3	**https://nptel.ac.in/courses/112106170**	**NPTEL**
4	**https://nptel.ac.in/courses/127103225**	**NPTEL**
5	**https://nptel.ac.in/courses/112106200**	**NPTEL**
6	**https://nptel.ac.in/courses/112105182**	**NPTEL**

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B. Tech Second Year (Mechanical Engineering)
Semester: III
Subject: Kinematics of Mechanisms and Machines
Course Code: 231MEPCCL202

Course Plan

Course Title : Kinematics of Mechanisms and Machines	
Course Code : 231MEPCCL202	**Semester : III**
Teaching Scheme : L-T-P : 2-0-0	Credits :2
Evaluation Scheme : ISE : 20 MSE Marks : 30	ESE Marks : 50

Prerequisite: Engineering Physics, Engineering mathematics and Engineering Mechanics

Course Description:

Kinematics and theory of Machines may be defined as that branch of Engineering-science, which deals with concepts of mechanisms, the study of relative motion between the various parts of a machine, and forces acting on them. The knowledge of this subject is very essential for an engineer in designing the various parts of a machine.

Course Objectives:

1	To describe various terminology related to kinematics of mechanism
2	To develop competency in drawing velocity and acceleration diagram for mechanisms
3	To study the different types of cam and follower motion and its selection for engineering application
4	To study basics of power transmission devices, different types of governors and turning diagram of flywheel

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Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Understand fundamental & various terminology associated with kinematics of mechanism and machine	L2
2	Prepare velocity and acceleration diagram for a given mechanism with graphical method	L2
3	Prepare cam profile with respect to follower motion for different application	L3
4	Explain need and modes of power transmission, types of governors and turning moment diagram of flywheel with their engineering application	L3

Course Content

Content	Hours
Unit 1 : Fundamentals of Mechanisms	05
Link, Kinematic pair, Kinematic chain, Mechanism, Inversions, Types of constrained motions, Grubber's criterion, Grashoff's criterion for mobility, Kutzbach criterion, Four bar chain and its inversions, Slider crank chain and its inversions, Double slider crank chain and its inversions, Hooke's joint(only theoretical treatment).	
Unit 2 : Analysis of Mechanism	08
Graphical analysis of velocity and acceleration for different mechanisms using relative velocity and acceleration method, (Simple Problems), Klein's construction for slider crank mechanism, Instantaneous centre method	
Unit 3 : Cams and Followers	07
Types of cams and followers, Terminologies used ,profiles of cam for specified motion of the follower, spring load on the follower , Jumping of follower	
Unit 4: Belts, Dynamometers ,Governors and Flywheel	10
Introduction, Type of belts, Slip and creep of belt, Tension ratio in belts, Initial tension, Open & cross belt drive, Length of belt, Power transmitted by belt, Introduction and types of dynamometer, Types of governors, Porter and Hartnell governor, Controlling	

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force and stability of governor, Hunting, Sensitivity, Isochronism, Governor effort and power, Insensitiveness of governors. Flywheel: Turning moment diagrams, Fluctuation of energy, Coefficient of fluctuation of speed, Rimmed flywheel.	

Textbook:

1 "Theory of Machines", Rattan S.S, Tata McGraw Hill New Delhi, 5thKindle Edition.2019

2 "Theory of Machines", V.P. Singh, Dhanpat Rai and Sons. 6th Edition

Reference Books:

1. Theory of Machines and Mechanism", Shigley, McGraw Hill, New York, 4 th Edition,2014

2. "Theory of Machines", Dr. R.K. Bansal, Laxmi Publication.

3. "Theory of Machines and Mechanism", G.S. Rao and R.V. Dukipatti, New Age, Delhi.

4. "Theory of Machines", P.L.Ballany, Khanna Publication, New Delhi, 3rd Edition.

Online Resources:

Unit No	Online Resource Link	Source
1	https://archive.nptel.ac.in/courses/112/106/112106270/	NPTEL
2	https://archive.nptel.ac.in/courses/112/106/112106270/	NPTEL
3	https://nptel.ac.in/courses/116102012	NPTEL
4	https://nptel.ac.in/courses/116102012	NPTEL

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B. Tech Second Year (Mechanical Engineering)
Semester: III
Subject: Manufacturing Processes
Course Code: 231MEPCCL203

Course Plan

Course Title: **Manufacturing Processes**	
Course Code : 231MEPCCL203	**Semester: III**
Teaching Scheme : L-T-P : 3-0-0	Credits : 3
Evaluation Scheme : ISE : 20 MSE Marks : 30	ESE Marks : **50**

Prerequisite: Workshop Practice – I, Engineering Chemistry

Course Description:

The course is meant as an introduction towards primary manufacturing processes such as casting, forming and welding. Further apply this knowledge to select appropriate method for manufacturing specific job.

Course Objectives:

1.	Understand basic principal of metal casting, its types and moulding techniques.
2.	Study various metal joining processes and classify them according to application.
3.	Study various metal forming processes and their applications.
4.	Introduction to powder metallurgy and polymer processing.

Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Interpret basic concepts of metal casting processes and solve numerical on gating system	L3
2	Describe the fundamentals of metal joining processes & classify them	L2
3	Demonstrate their understanding of metal forming processes	L2
4	Explain powder metallurgy and various polymer processing techniques	L2

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Course Content

Content	Hrs
Unit 1: Metal Casting	09
Introduction to Manufacturing Processes, Classification of Manufacturing Processes, Importance of casting as manufacturing Process, advantages and disadvantages of Casting processes, Pattern, Types of patterns and cores and core boxes, materials used and selection criteria for pattern making, pattern allowances. Components of gating system, functions and importance of runners and risers, solidification control devices: chills, ceramics bricks, directional solidification. gating system calculations. Types of Moulding and core making sands and their properties, Green sand, shell sand CO2 sand, oil sand, Cold box process. Moulding machines and core making machines	
Unit 2: Melting Practice and Special Casting Processes	08
Types of melting Furnaces-Cupola furnace, oil/gas fired furnaces, crucible furnaces, Electrical furnaces, Rotary furnaces, etc. Furnace selection criteria their applications and melting practice on different furnaces. Metal pouring equipment's, Cleaning- fettling of castings. Casting defects, their causes and remedies. Inspection of casting. Investment casting, Continuous casting, Gravity die casting, pressure die-casting, Centrifugal casting, Vacuum die casting, Squeeze casting.	
Unit 3: Polymer Processing	04
Thermosetting and thermoplastic materials, their properties and applications, Introduction to blow moulding, injection moulding, extrusion, calendaring and thermo forming.	
Unit 4: Metal Joining Processes	07
Welding processes: - Overview and classification of welding processes Fusion welding Oxy fuel gas welding Arc welding- Theory, TIG, MIG, SMAW& SAW. Electric slag welding, Thermit welding, Pressure welding Resistance welding: Spot & Seam welding, Friction welding, Ultrasonic Welding, Brazing, Soldering &Polymer joining processes.	

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Unit 5: Metal Forming Processes	
Rolling: Introduction, Hot and cold rolling, Rolling Mill Classification, Defects in rolling. **Forging:** Introduction, Forging Machines (board Hammer, Air and Steam, Hydraulic Hammer), Open and Closed Die Forging, Defects in forging. **Extrusion:** Introduction, Direct, Indirect, Tube, Impact and Hydraulic Extrusion, Defects in extrusion. **Drawing:** Introduction and Types of Wire, rod and pipe drawing, defects in drawing.	**10**
Unit 6: Basics of Powder Metallurgy	
Flow & Stages of Powder Metallurgy Process - Mixing/ Blending - Compaction- types- Conventional, Isostatic, HERF, Powder rolling and extrusion - Sintering - Finishing operations: Sizing, Machining, Infiltration and Impregnation. Advantages, Limitations and Applications of Powder Metallurgy.	**04**

Textbook:

1. P. N. Rao, "Manufacturing Technology- Foundry, Forming and Welding", Vol. I, Tata McGraw- Hill, N 3rd edition, 2009
2. P. C. Sharma, "A Textbook of Production Technology (Manufacturing Processes)", S. Chand & Company, 2006

Reference Books:

1. Material science and metallurgy for engineers", V. D. Kodgire, Everest Publishers Pune, 12th Edition.
2. P. L. Jain, "Principles of Foundry Technology", Tata McGraw-Hill, New Delhi, 2nd Edition, 2006.
3. O. P. Khanna, Foundry technology, Khanna Publishers, New Delhi.
4. Sindo Kou Welding Metallurgy, 3rd Edition Willey- Blackwell Publication.
5. ASTM Volumes on Welding, casting, forming and material selection

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Online Resources:

Unit No	Online Resource Link	Source
1	https://nptel.ac.in/courses/112103273	NPTEL
2	https://nptel.ac.in/courses/112103273	NPTEL
3	https://nptel.ac.in/courses/112103244	NPTEL
4	https://nptel.ac.in/courses/112103244	NPTEL
5	https://nptel.ac.in/courses/112103244	NPTEL
6	https://nptel.ac.in/courses/112103273	NPTEL

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B. Tech Second Year (Mechanical Engineering)

Semester: III

Subject: Mini Project

Course Code: 231MECEPP201

Course Plan

Course Title : Mini Project	
Course Code : 231MECEPL201	**Semester : III**
Teaching Scheme : L-T-P : 1-2-0	Credits : 2
Evaluation Scheme : INT: 25, POE: 25	

Prerequisite: NIL

Course Description:

This course aims to provide students with hands-on experience in applying theoretical knowledge to practical projects. Throughout this course, students will engage in a series of activities aimed at enhancing their understanding of mechanical engineering concepts and fostering creativity and innovation. Emphasis will be placed on integrating theoretical concepts with real-world applications, ethical considerations in project work, collaboration, and effective communication skills.

Course Objectives:

1	To develop practical skills in applying mechanical engineering principles to real-world problems
2	To enhance problem-solving abilities through hands-on projects and demonstrations
3	To cultivate teamwork and collaboration skills through group work activities.
4	To foster innovation and creativity in designing and executing mechanical engineering projects

Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Understand Basic Elements used in Prototyping.	L2
2	Explain Working of basic Electronic Systems.	L2
3	Demonstrate Prototype Development Techniques.	L3

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Course Content

Content	Hours
Unit 1 : Basic Prototyping Elements	4
Resistors: Types, Color Coding, Capacitors, Inductors, LEDs, Diodes: Introduction to PN junction, Zener Diodes, BJT, MOSFET. Switches, Relays. Display Modules: LCD, TFT, OLED. Mechanical Elements: Robot Chassis, Transmission Elements etc.	
Unit 2 : Basic Electronic Systems and IoT	5
Introduction, pin diagrams and features of Arduino, ESP8266 and ESP32 CAM. Interfacing various sensors with microcontroller boards, communication Devices: Serial, I2C, UART, Wireless, Bluetooth etc., Introduction to IoT Prototyping.	
Unit 3 : Prototyping of Smart systems	5
Problem Definition, Concept Development, Selection of feasible solutions, design for prototype, selection of Mechanical and Electronic Components for Prototype, Interfacing of Mechanical Components with Microcontroller Boards, Prototyping techniques, JUGAAD Innovation approach. Case Studies: Mobile Robots, IoT Weather Station, smart systems in Agricultural.	

Sr. No.	Experiment/Assignment List	Type	Hrs.
1	Installation and Introduction to Arduino IDE	O	2
2	Controlling LED with Arduino	O	2
3	Distance Measurement using Arduino	O	2
4	Interfacing DC Motor, and Servo Motors with Arduino	O	2
5	Interfacing 16x2 LCD Display with Arduino	O	2
6	Demonstration of IoT based System with mobile app and ESP8266	O	2
7	Demonstration of IoT based System with web dashboard and ESP8266	O	2
8	Demonstration of Surveillance system using ESP32 cam	O	2
9	Problem definition and brainstorming	O	2
10	Finalizing Solution using Mind Map Technique.	O	2
11	Design and Preparation of BOM for Prototype	O	2
12	Development of Mini Project	O	2
13	Testing and Validation of Project	O	2
14	Presentation and Evaluation of Project	O	2

S-STUDY, O-OPERATIONAL

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Textbook:

1. Electronics Circuits: Fundamentals and Applications", Mike Tooley, RoutLedge (2013)
2. The Art of Innovation, Tom Kelley & Jonathan Littman, Profile Books Ltd, UK, 2008

Reference Books:

1. "The Art of Electronics" by Paul Horowitz and Winfield Hill, Cambridge University Press (2015)
2. Indian Innovators, Akhat Agrawal, Jaico Books, Mumbai, 2015
3 JUGAAD Innovation, Navi Radjou, Jaideep Prabhu, Simone Ahuja Random house India, Noida, 2012

Online Resources:

Sr. No	Online Resource Link	Source
1.	https://nptel.ac.in/courses/105106149	NPTEL
2.	https://onlinecourses.nptel.ac.in/noc24_cs25/preview	NPTEL

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B. Tech Second Year (Mechanical Engineering)
Semester: III
Subject: Management Theory And Organizational Behavior (MTOB)
Course Code: 231MEMDML201

Course Plan

Course Title : Management Theory And Organizational Behavior (MTOB)	
Course Code : 231MEMDML201	**Semester : III**
Teaching Scheme : L-T-P : 2-0-0	Credits : 2
Evaluation Scheme : ISE : 20	ESE Marks : **30**

Prerequisite: Basic understanding of English and Human Skills

Course Description:

This course provides a comprehensive understanding of the fundamental principles of management theory and how they influence organizational behavior. Through lectures, discussions, case studies, and simulations, students will gain the knowledge and skills necessary to be effective managers in today's complex business environment

Course Objectives:

1	Analyze the historical development of management thought and its impact on contemporary practices.
2	Evaluate different theoretical frameworks for understanding individual and group behavior within organizations.
3	Apply management principles to functions like planning, organizing, leading, and controlling.
4	Develop critical thinking and problem-solving skills in organizational contexts.
5	Enhance communication, teamwork, and leadership abilities.

Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Explain the fundamental functions, roles, and levels of management within organizations	L2
2	Differentiate between various departmentalization methods and their suitability for different organizational contexts.	L3
3	Explain group dynamics, including team formation stages, group decision-making, and strategies for effective conflict management.	L2
4	Understand approach to Organizational Behaviour	L2

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Course Content

Content	Hours
Unit 1 : Introduction to Management	7
Concept and Nature, Types of Managers, Responsibilities and skills of Professional Manager, Functions of Management, Taylor's Principles of Management, Fayol's Principles of Management, Modern Principles of Management, Administration vs. Management, Management Process, Levels of Management, Approaches to the study of Management	
Unit2 : Planning, Organizing and Motivation	8
Planning: Concept, Meaning and Definition, Process, Benefits and Limitations, Decision making: Concept, process & techniques, Depart-mentation, Delegation and Decentralization, Process Line and Staff Organization, Conflicts between Line and Staff, Measures to overcome the Conflicts, Span of Control Work Motivation, Theories of Motivation – Maslow's Hierarchy of Need Theory, Alderfer's ERG Theory, Herzberg's Motivation Hygiene Theory, McClelland's Achievement – Motivation Theory, McGregor's Theory X & Y, Vroom's Expectancy Theory, Porter Lawler Expectancy Model	
Unit 3 : Personality & Perception	8
Personality– Meaning of Personality, Determinants of Personality, Theories of Personality-Freudian Stages of Personality Development, Psychoanalytic Theory, Big 5 theory, Hofstede's Framework of Personality Analysis, Measurement of Personality - Myers-Brigg's Type Indicator Perception – Process and Principles, Nature and Importance, Factors Influencing, Perception, Perceptual Selectivity, Social Perception, Fundamentals of Decision making.	
Unit 4 : Organizational Behaviour	8
Organizational Behaviour, Change and Development: Concept, Meaning, Definition, Objectives, Importance and Limitations of OB – Interdisciplinary approach to Organizational Behaviour. Organizational Change: Concept, Objectives, Reasons, Resistance to change, Organizational Development: Concept, Process, Techniques of OD.	

Textbook:

1. Organisational Behaviour by Ashwathapa Das (Tata McGraw Hill Education, 15th edition)
2. Management by Stoner, Freeman & Gilbert (Cengage Learning India, 9th edition)
3. Human Resource Management: An Indian Perspective by P.C. Tripathi & P. Meenakshi Pearson Education India, 18th edition
   Essentials of Organizational Behaviour by Stephen P. Robbins & Timothy A. Judge
4. Organizational Behaviour Global Edition, Pearson Education Limited, 16th edition

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Reference Books:

1. Management and Organisational Behaviour by David Buchanan & Andrzej Wrzesinski (Pearson Education Limited, 12th edition)

2. Leading Change by John Kotter (Harvard Business Review Press, Reprint edition)

3. Management: Concepts, Practices and Cases (Indian Context) by Prasanna Chandra Tata McGraw Hill Education

4. Strategic Management: Text and Cases (Indian Context) by Azim Jamal & Vijay Govindarajan (Wiley India)

Online Resources:

1. https://archive.nptel.ac.in/courses/110/106/110106145
2. https://archive.nptel.ac.in/courses/110/106/110106145
3. https://onlinecourses.nptel.ac.in/noc20_mg51/preview
4. https://archive.nptel.ac.in/courses/110/108/110108047

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B. Tech Second Year (Mechanical Engineering)
Semester: III
Subject: Positive Attitude and Behavior
Course Code: 231MEVECL201

Course Plan

Course Title : Positive Attitude and Behavior	
Course Code : 231MEVECL201	**Semester : III**
Teaching Scheme : L-T-P : 1-0-0	Credits : 01
Evaluation Scheme : INT Marks : 25	

Prerequisite: No

Course Description:

This course focuses on cultivating a positive mindset and behavior for personal and professional growth. Through theoretical discussions and practical exercises, students will explore the importance of maintaining positivity in various life domains. Topics include resilience, effective communication, fostering relationships, and self-awareness.

Course Objectives:

1	Understand the significance of positive attitude and behavior in personal and professional life.
2	Develop strategies for managing stress and adversity effectively.
3	Enhance communication skills for building positive relationships.
4	Foster self-awareness and reflection to promote personal growth.
5	Apply principles of positive psychology to improve overall well-being.

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Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Identify the characteristics of positive attitude and behavior.	L1
2	Explain the importance of positivity in different life contexts	L2
3	Analyze the impact of attitude and behavior on personal well-being	L3
4	Create a personal action plan for maintaining a positive mindset.	L4
5	Evaluate the effectiveness of different strategies for promoting positivity	L5

Course Content

Content	Hours
Unit 1 : Title : Introduction to Positive Attitude and Behavior (2 Hours)	2
Definition and significance of positive attitude and behavior - Theoretical frameworks: Positive psychology, resilience theory - Characteristics of resilient individuals	
Unit 2 : Title : Managing Stress and Adversity (3 Hours)	3
- Understanding stress: Causes, effects, and coping mechanisms - Techniques for managing stress effectively - Building resilience and bouncing back from setbacks	
Unit 3 : Title : : Effective Communication (2 Hours)	2
- Importance of effective communication in personal and professional relationships - Verbal and non-verbal communication skills - Active listening and empathy	
Unit 4 : Title : Fostering Positive Relationships (2 Hours)	3
- Building rapport and trust - Conflict resolution strategies - Practicing assertiveness and empathy	
Unit 5 : Title : : Self-awareness and Reflection (2 Hours)	2
- Understanding personal values and beliefs - Self-assessment: Identifying strengths and areas for improvement - Reflective exercises for promoting personal growth	

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Unit 6 : Title : : Applying Positive Psychology Principles (3 Hours)	2
Syllabus - Techniques for cultivating gratitude and mindfulness - Goal setting and achievement - Promoting well-being through positive habits and practices	

Textbook:

1. "The Power of Positive Thinking" by Norman Vincent Peale
2. "Resilience: Hard-Won Wisdom for Living a Better Life" by Eric Greitens

Reference Books:

1. "Positive Psychology: The Science of Happiness and Flourishing" by William C. Compton and Edward Hoffman
2. "The Happiness Advantage: How a Positive Brain Fuels Success in Work and Life" by Shawn Achor

Online Resources:

1. PositivePsychology.com
2. Greater Good Magazine by UC Berkeley's Greater Good Science Center

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B. Tech Second Year (Mechanical Engineering)
Semester:
Subject: Human Resource Management
Course Code: 231MEOECL201

Course Plan

Course Title : Human Resource Management	
Course Code : 231MEOECL201	**Semester :**
Teaching Scheme : L-T-P : 4-0-0	Credits : 4
Evaluation Scheme : ISE : 20 MSE : 30 INT : 25	ESE Marks : **50**

Prerequisite: Basic understanding of English and Human Skills

Course Description:

In this course students will learn the role of the human resource professional. Also learn about Key functions such as selection, recruitment, development, retention, appraisal, compensation and labor relationship. Best practices of employers of choice are considered.

Course Objectives:

1	Define the objectives, scope and functions of human resource management.
2	To impart knowledge about problems Job Description and Recruitment Process.
3	To impart knowledge about Training and Development in an organization.
4	To make aware with Compensation and Reward Management.
5	To introduce with concepts of HR Analytics and problem solving tools.
6	To introduce Industrial Relations

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Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Describe key human resource functions within organizations.	L 2
2	Describe Job Description and Recruitment Process.	L 3
3	Identify Need of Training and Development.	L 2
4	Describe the Importance of Compensation and Reward Management	L 2
5	Interpret HR Analytics and problem solving tools.	L2
6	Understand how to develop Industrial Relations	L2

Course Content

Content	Hours
Unit 1: Introduction to Human Resource Management	7
Introduction, Objectives, Scope, Importance of HRM, Features of HRM, Functions, Role, Policies and Practices, Challenges of HRM.	
Unit 2: Human Resource Procurement	8
Definition, Objective, Need and Importance, Human Resource Planning Process, Barriers to HRP. Job Analysis Process – contents of Job Description, biodata /CV writing and Job Specification, Job Description. Recruitment - Selection Process Recruitment, Induction and Orientation. Career Planning, Transfer and Promotion. Retention of Employees.	
Unit 3: Training and Development	8
Framework of Training and Development of employees, Role of Training in organizations, Objectives, Process, Training Need Assessment, Types of Training, Difference between Training and Development, E-learning. Benefits of Training, CS	

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Responsibilities. Distribution.	
Unit 4: Compensation and Reward Management	
Concept, Objectives, Importance of Compensation Management, Process of Compensation, Plan, Wage/Salary differentials, Components of Salary. Incentives and Benefits- Need, Financial and Nonfinancial Incentives, Fringe Benefits. Employee Separation- VRS, Retirement, Golden Handshake, Termination, Suspension	8
Unit 5 : HR Analytics & Recent Trends	
Role and Responsibilities of HR Analytics, Framework of HR Analytics –Predictive tools and applications in solving problems using HR Analytics HR Audit, Balance Score card, HRIS, HR Accounting, HR Shared Services, Issues creating HR shared services	8
Unit 6 : Industrial Relations	
Building Relationships – Facilitating Legislative Framework - Trade Unions - Managing Conflicts - Disciplinary Process - Collective Bargaining - Workers Participation in Management - Concept, Mechanisms and Experiences.	6

Sr No.	List of Assignment	Type
1	Introduction to Human Resource Management	S
2	Features of Human Resource Management	S
3	Job Analysis	S
4	Recruitment	S
5	Framework of Training and Development	S
6	Role of Training in Organizations	S
7	Compensation And Reward Management	S
8	Incentives and Benefits	S
9	HR Analytics	S
10	Framework of HR Analytics	S
11	Recent Trends in Human Resource Management	S
12	HR Audit	S

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Textbook:

1 "Principles of Human Resource Management", George W. Bohladender, Scott a Snell, Cengage Learning, 2013

2 "Human Resource Management", Pravin Durai, Pearson, 2010.

3 "Human Resource Management", Biswajeet Patnayak,

4 "Management of Human Resource", R. S. Diwivedi.

Reference Books:

1. "Human Recourse Management", Ian Breadsevace and len Holden.

2. "Human Resource Management", Michael Armstrong, kogan page 2006.

3. "Human Resource Management", Garry Dessler, Prentice Hall 2015.

4 "Human Resource Management", Cynthia D. Fisher, Lyle F. Schoenfeldt, James B. Shaw.

Online Resources:

Unit No	Online Resource Link	Source
1	https://onlinecourses.nptel.ac.in/noc20_hs48/preview	Swayam
2	https://onlinecourses.swayam2.ac.in/imb23_mg67/preview	Swayam
3	https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-hs63/	NPTEL
4	https://onlinecourses.swayam2.ac.in/cec21_mg06/preview	Swayam
5	https://archive.nptel.ac.in/courses/110/101/110101164/	NPTEL
6	https://www.youtube.com/watch?v=Y4XHzX5VE7g	Youtube/NPTEL

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B. Tech Second Year (Mechanical Engineering)
Semester: III
Subject: Industrial Management
Course Code: 231MEHSSML201

Course Plan

Course Title : Industrial Management	
Course Code : 231MEHSSML201	**Semester : IV**
Teaching Scheme : L-T-P : 2-0-0	Credits : 2
Evaluation Scheme : ISE : 20	ESE Marks : **30**

Prerequisite: Basic knowledge of industrial terminologies in relative industries *viz.* mechanical, electronics, chemical, computer etc.

Course Description:

This course provides an overview of management principles and techniques in industrial settings. Students will learn about planning, organizing, leading, and controlling industrial operations, as well as concept of marketing management and production management. The course will also cover topics related financial and cost management aspects. Through case studies, students will get knowledge about starting of SSI and project report writing.

Course Objectives:

1	To understand various functions of management.
2	To know Production and marketing functional area of management.
3	To get knowledge about how to start SSI.
4	To understand financial management and cost related aspect

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Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
415.1	Understand the concept and principles of management	L 2
415.2	Apply the planning, organizing, staffing, directing, and controlling functions of management in given situation.	L 3
415.3	Judge the problems related to production management and marketing management	L 2
415.4	Understand the steps involved in starting a small-scale industry	L 2

Course Content

Content	Hours
Unit 1 : Basics of Management	8
Definition Of Management, Characteristics Of Management, Managerial Skills , Different Levels of Management, Structure , Function of management , Scientific Management Contribution of F.W.Taylor, Henry Fayol, Henry-Fayol's, Forms Of Ownerships – Partnership, Proprietorship, Joint Stock, Co-Operative Society, Govt. Sector Etc, Concept Of Globalization	
Unit 2 : Function of management	8
Planning –Objectives, Steps in Planning, elements of planning, Organizing – Process of Organizing, importance and principle of organizing, departmentation, Span of control. Staffing – Nature, Purpose, Scope, Human resource management, Policies, Recruitment procedure, training and development, appraisal methods. Directing – Leadership style, Communication process, Barriers, remedies, Motivation, importance Herzberg's theory, Maslow's theory, McGregor's theory . Controlling–Process, Requirement for control management	

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Unit 3 : Functional Areas of Management	
Production Management-Product mix, line balancing, break even analysis, Total Productive Maintenance, Problem solving Techniques. Marketing Management –Principles & Functions, Types of Market, Market Research, Market Segmentation, Marketing Mix, Advertisement, Channel Of Distribution.	**8**
Unit 4 : SSI & Entrepreneurship Development	
Types of small scale industries (SSI), Steps involved in starting SSI, Registration Procedure for SSI, Financial Assistance, , Government policies for SSI, Problems of SSI, Project report writing, Industrial Safety, Concept of Entrepreneurship, Required Qualities of Good Entrepreneur , Failure of Entrepreneur	**6**

Textbook:

1 "Industrial Engineering and Management", by O. P. Khanna, Dhanpatrai publications Ltd, New Delhi.
2 "Industrial Management and Operation Research", Nandkumar Hukeri, Electrotech Publication.

Reference Books:

1. "Essentials of Management", Koontz and H.Weinrich, Tata McGraw Hill Publication, 12th Edition.
2. "Management, Today – Principles and Practice", Gene Burton and Manab Thakur, Tata McGraw Hill Publishing Company, New Delhi.
3. "Business Management", J.P.Bose, S. Talukdar, New Central Agencies (P) Ltd.,
4 "Production and Operation Management", Tripathy, Scitech Publication, 2nd Edition.
5 "Management", James A.F. Stoner, R. Edward Freeman, Prentice Hall of India New Delhi

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Online Resources:

Unit No	Online Resource Link	Source
1	https://archive.nptel.ac.in/courses/110/105/110105094/	NPTEL
2	https://archive.nptel.ac.in/courses/110/101/110101132/	NPTEL
3	https://onlinecourses.nptel.ac.in/noc23_mg33/preview	NPTEL
4	https://archive.nptel.ac.in/courses/127/105/127105007/	NPTEL

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Professor & Head
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B. Tech Second Year (Mechanical Engineering)
Semester: III
Fluid Mechanics and Machineries Lab
Course Code: 231MEPCCP201

Course Plan

Course Title : Fluid Mechanics and Machineries Lab	
Course Code : 231MEPCCP201	**Semester : III**
Teaching Scheme : L-T-P : 0 – 0 - 2	Credits : 1
Evaluation Scheme :	INT Marks : 25 POE Marks : **25**

Prerequisite: Applied Physics, Applied Chemistry

Course Description:

Fluid Mechanics is a fundamental branch of physics and engineering that explores the behavior of fluids (liquids and gases) and their interactions with solid bodies. This course provides students with a comprehensive understanding of the principles governing fluid flow, fluid statics, and fluid dynamics. Through theoretical study, problem-solving exercises, and laboratory experiments, students will develop the skills necessary to analyze and predict the behavior of fluids in various engineering and scientific applications.

Course Objectives:

1	To study physical significance of fluid kinematics, fluid dynamics and its applications.
2	To understand the different form of governing equation related to fluid flow.
3	To analyze and evaluate fluid mechanics systems by applying principles of Physics, mathematics, science and engineering.
4	To develop skills in the analysis of fluid systems for lifelong learning
5	To understand the working principles of Impulse and Reaction water turbines also to study its velocity triangles & design parameters related to Turbines

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Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Identify the fluid flow problem and explain the theoretical concepts of fluid kinematics and fluid dynamics.	L2
2	Apply governing equation of fluid mechanics i.e. Continuity equation, Bernoulli's Equation and momentum equation for different fluid flow applications.	L3
3	Apply momentum equation and make basic analysis of laminar flow to calculate the energy losses.	L3
4	Analyze the energy losses in fluid flow systems.	L4
5	Apply theory of boundary layer, Drag and lift forces in proper cases	L3
6	Understand & Apply working principle of Rotodynamic machines	L3

Course Content

Sr. No.	Experiment/Assignment List	Type	Hrs.
1	I. Theoretical assignment of Dimensional analysis which may include procedure and Numerical on Rayleigh's method II. Buckingham π theorem. (Compulsory)	S	4
2	Verification of Bernoulli's equation	O	2
3	Calibration of Orifice meter	O	2
4	Calibration of venturi meter	O	2
5	Calibration of notches	O	2
6	Determination of coefficient of friction in pipes of different sizes	O	2
7	Determination of minor losses in pipes-fittings	O	2
8	Case study on CFD	S/O	2
9	Trial on Pelton wheel with characteristics curve	O	2
10	Study of Francis turbine and Kaplan Turbine	S	4

S-STUDY, O-OPERATIONAL

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Textbook:

1 "Fluid Mechanics", R. K. Bansal, Laxmi publications. New Delhi, 2018.

2 "Fluid mechanics and Hydraulic Machines", Modi and Seth, 22nd Edition2018.

Reference Books:

1. "Fluid Mechanics", V.L. Streeter and E.B. Wylie, Tata McGraw Hill Pvt. Ltd., New Delhi, 2017.

2. "Mechanics of Fluid", Merle C. Potter, Prentis Hallof India, New Delhi, 2nd Edition.

3. "Fluid Mechanics", Fox and McDonald, John Wiley and Sons, New York, 8th Edition.

4. "Fundamentals of Fluid Mechanics", B.R. Munson, D.F. Young, T. H. Okiishi Wiley India Pvt. Ltd.

5. "Fluid Mechanics and Machinery", C.S. Ojha, , Oxford University Press.

Online Resources:

Experiment No	Online Resource Link	Source
1	**https://nptel.ac.in/courses/127103225**	**NPTEL**
2	**https://nptel.ac.in/courses/105103095**	**NPTEL**
3	**https://nptel.ac.in/courses/105103095**	**NPTEL**
4	**https://nptel.ac.in/courses/105103095**	**NPTEL**
5	**https://nptel.ac.in/courses/105103095**	**NPTEL**
6	**https://nptel.ac.in/courses/127103225**	**NPTEL**
7	**https://nptel.ac.in/courses/127103225**	**NPTEL**
8	**https://nptel.ac.in/courses/112103289**	**NPTEL**
9	**https://nptel.ac.in/courses/112106200**	**NPTEL**
10	**https://nptel.ac.in/courses/112106200**	**NPTEL**

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B. Tech Second Year (Mechanical Engineering)
Semester: III

Kinematics of Mechanism and Machines Lab

Course Code: 231MEPCCP202

Course Plan

Course Title : Kinematics of Mechanism and Machines Lab	
Course Code : 231MEPCCP202	**Semester : III**
Teaching Scheme : L-T-P : 0-0-2	Credits : 1
Evaluation Scheme :	ISE Marks : 25

Prerequisite: Engineering physics, engineering mathematics, fundamentals of engineering mechanics,

Course Description:

Kinematics and theory of Machines may be defined as that branch of Engineering-science, which deals with concepts of mechanisms, the study of relative motion between the various parts of a machine, and forces acting on them. The knowledge of this subject is very essential for an engineer in designing the various parts of a machine.

Course Objectives:

1	To describe various terminology related to kinematics of mechanism
2	To develop competency in drawing velocity and acceleration diagram for mechanisms
3	To study the different types of cam and follower motion and its selection for engineering application.
4	To study basics of power transmission devices, different types of governors.

Course Outcomes (COs): At the end of the course the student should be able to:

CO	Statement	BTL
1	Understand fundamental & various terminology associated with kinematics of mechanism and machine	L2
2	Prepare velocity and acceleration diagram for a given mechanism with graphical method.	L3
3	Prepare cam profile with respect to follower motion.	L3
4	Analyze parameters of power transmission elements and governors.	L4
5	Demonstrate various types of brakes and clutches.	L3

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Course Content

Sr. No.	Experiment/Assignment List	Type	Hrs.
1	To study various types of kinematics links, pairs, chains & mechanisms.(Demonstration of models of different links, pairs and mechanisms)	S	2
2	Verification of ratio of angular velocities of the shafts connected by Hooke's Joint.	O	2
3	Draw velocity problems on A3 size drawing by relative velocity method (minimum 3 problems)	O	2
4	Draw velocity problems on A3 size drawing by I)Klein's method (minimum 2 problems for each case) II) Instantaneous method (minimum 2 problems for each case)	O	2
5	Draw acceleration problems on A3 size drawing by relative acceleration component method (minimum 3 problems) I)Basic Numerical 2-Problem on acceleration II) Advance Numerical 2-Problem on acceleration	O	2
6	Experiment on cam profile and Jump phenomenon in cam and follower	O	2
7	Problems on cam profile on A3 size drawing sheet	O	2
8	An Experiment to study governor characteristics for Porter or Hartnell governor.	O	2
9	An experiment to find belt transmission slip.	O	2
10	An experiment to find braking power of Rope brake dynamometer.	O	2
11	Study of Various types of Brakes	S	2
12	Study of Various types of Clutches	S	2

S-STUDY, O-OPERATIONAL

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Textbook:

1 "Theory of Machines", Rattan S.S, Tata McGraw Hill New Delhi, 5thKindle Edition.2019

2 "Theory of Machines", V.P. Singh, Dhanpat Rai and Sons. 6th Edition

Reference Books:

1. Theory of Machines and Mechanism", Shigley, McGraw Hill, New York, 4 th Edition,2014

2. "Theory of Machines", Dr. R.K. Bansal, Laxmi Publication.

3. "Theory of Machines and Mechanism", G.S. Rao and R.V. Dukipatti, New Age, Delhi.

Online Resources:

Unit No	Online Resource Link	Source
1	**https://archive.nptel.ac.in/courses/112/106/112106270/**	**NPTEL**
2	**https://archive.nptel.ac.in/courses/112/106/112106270/**	**NPTEL**
3	**https://nptel.ac.in/courses/116102012**	**NPTEL**
4	**https://www.vlab.co.in/broad-area-mechanical-engineering**	**Virtual Labs**

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B. Tech Second Year (Mechanical Engineering)
Semester: III
Subject: Positive Attitude and Behaviour Lab
Course Code: 231MEVECP201

Course Plan

Course Title : Positive Attitude and Behavior Lab	
Course Code : 231MEVECP201	**Semester :**
Teaching Scheme : L-T-P : 0-0-2	Credits : 1
Evaluation Scheme :	INT Marks : **25**

Prerequisite: No

Course Description:

This course focuses on cultivating a positive mindset and behavior for personal and professional growth. Through theoretical discussions and practical exercises, students will explore the importance of maintaining positivity in various life domains. Topics include resilience, effective communication, fostering relationships, and self-awareness.

Course Objectives:

1	Understand the significance of positive attitude and behavior in personal and professional life.
2	Develop strategies for managing stress and adversity effectively.
3	Enhance communication skills for building positive relationships.
4	Foster self-awareness and reflection to promote personal growth.
5	Apply principles of positive psychology to improve overall well-being.

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Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Identify the characteristics of positive attitude and behavior.	L1
2	Explain the importance of positivity in different life contexts	L2
3	Analyze the impact of attitude and behavior on personal well-being	L3
4	Create a personal action plan for maintaining a positive mindset.	L4
5	Evaluate the effectiveness of different strategies for promoting positivity	L5

Course Content

Sr. No.	Experiment/Assignment List	Type	Hrs.
1	**Stress Management Workshop** Introduction to stress management techniques - Guided relaxation exercises - Stress coping strategies and resilience-building activities	O	4
2	**Communication Skills Exercises** - Verbal and non-verbal communication activities - Active listening exercises - Role-plays for practicing effective communication in different scenarios	O	2
3	**Team Building Activities** - Group activities for building rapport and trust - Collaboration exercises to enhance teamwork - Problem-solving tasks to promote constructive communication and cooperation	O	2
4	**Conflict Resolution Workshop** - Techniques for resolving conflicts peacefully - Role-plays to practice assertiveness and empathy in conflict situations - Mediation exercises for facilitating constructive dialogue	O	2
5	**Self-awareness and Reflection Exercises** - Guided self-assessment activities - Reflection prompts for identifying personal strengths and areas for improvement - Journaling exercises for promoting self-awareness and personal growth	O	2
6	**Application of Positive Psychology Principles** - Gratitude journaling and mindfulness practices - Goal-setting exercises for promoting well-being - Creating personal action plans for applying positive psychology principles in daily life	O	2

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Textbook:

1. "The Power of Positive Thinking" by Norman Vincent Peale
2. "Resilience: Hard-Won Wisdom for Living a Better Life" by Eric Greitens

Reference Books:

1. "Positive Psychology: The Science of Happiness and Flourishing" by William C. Compton and Edward Hoffman
2. "The Happiness Advantage: How a Positive Brain Fuels Success in Work and Life" by Shawn Achor

Online Resources:

1. PositivePsychology.com
2. Greater Good Magazine by UC Berkeley's Greater Good Science Center

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B. Tech Second Year (Mechanical Engineering)
Semester: IV
Subject: Strength of Materials
Course Code: 231MEPCCL204

Course Plan

Course Title : Strength of Materials	
Course Code : 231MEPCCL204	**Semester : IV**
Teaching Scheme : L-T-P : 2 - 0 - 0	Credits : 2
Evaluation Scheme : ISE : 20 MSE Marks : 30	ESE Marks : **50**

Prerequisite: Engineering Mechanics

Course Description:

Strength of Materials is a foundational course in engineering that delves into the behavior of solid materials under various types of loading and stresses. This subject deals with concepts of stress and strain, their importance in engineering applications which is useful while studying kinematics of machines, dynamics of machines and design of mechanical elements.

Course Objectives:

1	To study the distribution of Bending & Shear stresses in mechanical elements.
2	To study the analytical and graphical method to solve the problems in principal planes and stresses.
3	To study the effect of component dimensions and shape on stresses and deformations.
4	To study the buckling, and strain energy effect in mechanical elements.

Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Compute bending and shear stresses in mechanical components.	L3
2	Determine plane stress, principal stress, maximum shear stress and their orientations using analytical method and Mohr's circle.	L3
3	Calculate the Slope and deflection in beams.	L3
4	Describe buckling in columns and strain energy in beams subject to various types of loading.	L2

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Course Content

Content	Hours
Unit 1 : Stresses in Beams	8
I. Bending Stresses: Symmetric pure bending of beams, Flexure formula, moment of resistance of cross-sections, Determination of bending stress in rectangular, circular, L, I and T sections II. Shear Stresses: Distribution of shear stresses in beams of various Commonly used sections such as circular. I, T, and angles	
Unit 2 : Principal Stresses	8
Normal and shear stresses on any oblique planes, Concept of Principal planes, Expression for Principal stresses and maximum shear stress, Positions of principal planes and planes of maximum shear, Graphical solutions using Mohr"s circle of Stresses, Theories of failure.	
Unit 3 : Deflection of Beams	7
Concept and definition, Slope and deflection by Double integration method and Area moment method (Simply Supported Beam and Cantilever.) and conjugate beam method	
Unit 4 : Columns and Energy methods	7
I. Columns: Euler's formula for different end connections, Concept of equivalent length, Rankine formula. II. Energy Methods: Concept of strain energy, Resilience, Proof resilience, Modulus of Resilience, derivation for deformation of axially loaded members	

Textbook:

1 "Turbo machines", S.M. Yahya , Tata Mc Graw Hill , 2005

2 "Fans, compressor and turbine", S. M. Yahya, Tata Mc Graw Hill , 2005

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Reference Books:

1. "Hydraulic Machines", V.P. Vasantdani, Khanna Publishers, 1996.
2. "Fluid flow machines", N.S. Govindrao, Tata McGraw-Hill, 1983.
3. "Steam and gas Turbines", R. Yadav, Central Publishing House, Allahabad, 6th Edition1997
4. "Fluid mechanics and hydraulic machines", Modi and Seth, Standard Book House, 2004
5. "Thermal Engineering", R K Rajput, Laxmi Publication.

Online Resources:

Unit No	Online Resource Link	Source
1	**https://nptel.ac.in/courses/105105108**	**NPTEL**
2	**https://nptel.ac.in/courses/112103299**	**NPTEL**
3	**https://nptel.ac.in/courses/105105108**	**NPTEL**
4	**https://nptel.ac.in/courses/105105105**	**NPTEL**

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B. Tech Second Year (Mechanical Engineering)
Semester: IV
Subject: Dynamics of Machines
Course Code: 231MEPCCL205

Course Plan

Course Title : Dynamics of Machines	
Course Code : 231MEPCCL205	**Semester : III**
Teaching Scheme : L-T-P : 3-0-0	Credits : 3
Evaluation Scheme : ISE: 20 MSE : 30	ESE : 50

Prerequisite: Engineering Physics, Engineering mathematics, Engineering Mechanics and kinematics of Mechanism and Machines

Course Description:

This course is deals with an introduction to gear geometry, types of gear teeth profile and phenomena of interference. Other topics covered include types of gear trains, Inertia forces and torques in mechanisms, balancing of rotary and reciprocating masses along with multi-cylinder in- line engines radial and V- engines, effect of gyroscopic couple in machinery, Free and forced vibrations of SDoF and TDoF with and without viscous damping, introduction to vibration measuring instruments.

Course Objectives:

1	To study the gear geometry, gear profile, theory of gears and various types of gear trains used for transmission of motion and power.
2	To study the gyroscopic effects on vehicles, aero plane, ship, four wheeler and two wheeler.
3	To study static and dynamic balancing of rotary and reciprocating masses.
4	To study basics of concepts of vibration analysis and acquaint with the principles of vibration measuring instruments

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Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Understand various terminology associated with gear and gear trains.	L2
2	Understand the gyroscopic effects on vehicles, aeroplane, ship, four wheeler and two wheeler.	L2
3	Apply the static and dynamic balancing concepts for balancing rotary and reciprocating masses.	L3
4	Prepare mathematical model for the vibratory system for free and forced vibrations.	L3
5	Illustrate vibratory response of forced vibration with single degree of freedom system.	L3
6	Select suitable instruments for measuring vibration parameters.	L3

Course Content

Content	Hours
Unit 1 : Gears and Gear Trains	07
Gear geometry, Types of gear profile- Involute & cycloid, Theory of Spur gear, Interference in Involute tooth gears and methods for its prevention, Path of contact, Contact ratio. Types of Gear trains - Simple, Compound, Reverted, Epicyclic gear train, Tabular method for finding the speeds of elements in epicyclic gear train, Torque in epicyclic gear train, Differential gear box(theoretical gearing).	
Unit 2 : Gyroscope	06
Gyroscopic couple, spinning and precessional Motion, Gyroscopic couple and its effect on i) Aero plane ii) Ship iii) Four-Wheeler iv) Two –Wheeler.	
Unit 3 : Balancing	08
Static and dynamic balancing of rotary masses, balancing of single rotary mass, balancing of several masses rotating in same plane, balancing of several masses rotating in different Planes, balancing of reciprocating masses- primary and secondary forces and couples,	

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balancing of single cylinder, multi cylinder.	
Unit 4: Free Vibrations of Single Degree of Freedom System	**08**
Importance of study of vibrations, Causes and effects of vibrations, Definition, Terminology and classification of vibrations, Harmonic Motions, vector and complex method of representation of Harmonic motion, superposition of Motion and Beat Phenomenon. Undamped Free vibrations-differential equation of motion for SDoF, longitudinal and torsional vibrations, equivalent springs Damped free vibrations -Different types of damping, free vibrations with viscous damping-critically, overdamped and underdamped systems, logarithmic decrement.	
Unit 5 : Forced Vibrations of Single Degree of Freedom System	**07**
Forced vibrations with constant harmonic excitations, Frequency response plot, force vibrations with rotating and reciprocating unbalance, force vibration due to base excitation, force transmissibility and motion transmissibility	
Unit 6: Introduction to Two DoF system and Vibration Measuring Instruments	**06**
Principle mode of vibrations , case of simple 2DOF system, undamped forced vibration with harmonic excitation and vibration measuring instruments viz, vibrometer, accelerometer, frequency measuring devices , Fast Fourier transformer (FFT)	

Textbook:

1 "Theory of Machines", Rattan S.S, Tata McGraw Hill New Delhi, 5thKindle Edition.2019
2 "Theory of Machines", V.P. Singh, Dhanpat Rai and Sons. 6th Edition
3 "Mechanical Vibrations", Singiresu S.Rao , Pearson Education, ISBM –81-297-0179-0 - (2018).
4 Mechanical Vibrations", G. K. Grover, Published by Nemchand and Brothers, Roorkee
5 "Mechanical Vibrations", Dr. V. P. Singh, Published by S. Chand and Sons New Delhi.

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Reference Books:

1. Theory of Machines and Mechanism", Shigley, McGraw Hill, New York, 4 th Edition,2014
2. "Theory of Machines", Dr. R.K. Bansal, Laxmi Publication.
3. "Theory of Machines and Mechanism", G.S. Rao and R.V. Dukipatti, New Age, Delhi.
4. "Theory of Machines", P.L.Ballany, Khanna Publication, New Delhi, 3rd Edition.
5 "Mechanical Vibration",Austin Church, Wiely Eastern. 2nd Edition.
6 "Mechanical Vibrations", J.P. Den Hartog, Tata McGrawhill Book Company Inc., 4th Edition.

Online Resources:

Unit No	Online Resource Link	Source
1	**https://archive.nptel.ac.in/courses/112/106/112106270/**	**NPTEL**
2	**https://archive.nptel.ac.in/courses/112/106/112106270/**	**NPTEL**
3	**https://nptel.ac.in/courses/116102012**	**NPTEL**
4	**https://nptel.ac.in/courses/116102012**	**NPTEL**
5	NPTEL :: Mechanical Engineering - NOC:Introduction to Mechanical Vibration	**NPTEL**
6	NPTEL :: Mechanical Engineering - NOC:Introduction to Mechanical Vibration	**NPTEL**

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B. Tech Second Year (Mechanical Engineering)
Semester: IV
Subject: Machine Tools and Processes
Course Code: 231MEPCCL206

Course Plan

Course Title : Machine Tools and Processes	
Course Code : 231MEPCCL206	**Semester : IV**
Teaching Scheme : L-T-P : 3-0-0	Credits : 2
Evaluation Scheme : ISE :20 MSE Marks : 30	ESE Marks : **50**

Prerequisite: Basic Mechanical Engineering, Machine Drawing, Manufacturing Processes.

Course Description:

The Subject Machine tools and Processes is focused on the study of introduction to various types of metal cutting processes and machine tools. It includes the study of general purpose machine tools such as center lathe, capstan lathe, turret lathe, drilling, milling along with their accessories and attachments. It also includes study of single point and multi-point cuttings tools. Non-conventional machining processes along with the CNC Technology and tooling's are included. This course intends to bring the competency in the students to identify and select a proper machine tools, proper cutting tools, types of operations, and use of accessories and attachments on the machine tools.

Course Objectives:

1	To introduce and demonstrate the fundamentals of machining processes and machine tools.
2	To develop knowledge and importance of metal cutting parameters.
3	To introduce students to non-conventional machining processes.
4	To introduce the basic concepts of NC and CNC machines and programming codes.

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Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Understand The Concept And Basic Mechanics Of Metal Cutting	L
2	Describe the details and operations on lathe, planning, shaping and slotting	L
3	Discuss drilling and milling operations	L
4	Expose and appreciate the application of Finishing and Non conventional machining process	L
5	Explain the principle of NC and CNC machines	L
6	Familiarize with CNC part programs and fundamentals of CNC tools, cutting parameters and work holding devices.	L

Course Content

Content	Hours
Unit 1 : Mechanics of Metal cutting Process	06
Introduction, mechanics of cutting, geometry of single point cutting tool, types of chips produced in metal cutting, chip breakers, orthogonal cutting and oblique cutting, cutting Forces-Merchants circle, power estimation and temperatures generated in cutting, tool life, tool wear, machinability, cutting tool materials, cutting fluids-functions, types.	
Unit 2 : Lathe and Reciprocating machine Tools	08
Principle of Lathe, types of lathes, lathe components, specifications, tool and work holding devices, Lathe operations, material removal rate, machining time. Turret and capstan lathes: collet chucks, tool holding devices,tool geometry of single point cutting tool, Tool nomenclature. **Reciprocating machine Tools:** Shaper -Principal parts, Classification, Specification of shaper, Shaper Mechanisms, Types- Hydraulic shaper. Cutting Speed, Feed, Depth of cut & machining time-Various shaper operations-Introduction to Planer -Principal parts and working of Double housing Planer, Principal parts of Slotter-Working of slotter	
Unit 3 : Drilling And Milling Machines	**10**

Drilling operations- Twist drill geometry –Radial drilling machine-Jigs and Fixtures, Definition-Need of Jigs and Fixtures Drill Jig-Locating devices.Milling-Classification, Column and knee type milling machine - Milling cutters and classification-Fundamentals of milling processes-Milling operations. Indexing methods-Simple and compounding. Cutting speed, feed, depth of cut and machining time.	
Unit 4 : Super Finishing and Non-conventional Machining Process	**08**
Abrasive Processes- Grinding Wheel – Specifications and Selection, Types Of Grinding Process – Cylindrical Grinding, Surface Grinding, Centre less Grinding–Super finishing process- Honing, Lapping, Polishing And Buffing. Unconventional Machining Process - Classification, Electron Beam Machining, Laser Beam Machining, Electric Discharge Machining, Ultrasonic Machining, Abrasive Jet Machining. Additive manufacturing-Concept – Various applications of Additive manufacturing	
Unit 5 : Introduction to NC and CNC machine Tools	**04**
History and development of NC technology, conventional vs CNC machine tools, NC Machines, CNC Machines, CNC Machine Components, Co-ordinate System, Working Principle of Various CNC Systems, Direct Numerical Control, Adaptive Control tool changer, automatic pallet changer. Factors Influencing Selection of CNC Machines.	
Unit 6: CNC Part Programming, Tooling's and Work Holding devices.	**06**
CNC Part Programming: Part Programming Fundamentals- G and M Codes-Interpolation Systems-Methods of CNC Part Programming, Tooling and Work Holding Devices: Cutting Tool Material-Preset and Qualified Tools-ISO Specification of Tools- Chip Breakers-Principle of Location-Clamping-Work Holding Devices.	

Textbook:

1. Workshop Technology- WAJ Chapman - Volume I, II, & III – Vima Books Pvt. Ltd., 4262/3, Ansari Road, Daryaganj, New Delhi 110 002.
2. "A Text Book of Production Technology (Manufacturing Processes)", P.C. Sharma, S. Chand and Company Pvt. Ltd, New Delhi.7th Edition, 2010
3. "Workshop Technology vol. II", B.S. Raghuvanshi, Dhanpat Rai Publications Pvt. Ltd, New Delhi.10th Edition, 2000

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Reference Books:

1. HMT Hand book- Production Technology Roy A. & Linberg- "Processes and materials of manufacturing", Prentice Hall of India Delhi.
2. "Elements of Workshop Technology vol.I& II", S.K. Hajra Choudhury and A.K. Hajra Choudhury , Media promoters and Publishers Pvt. Ltd, New Delhi, 13thEdition,2012
3. "Workshop Technology vol. II", W. A. J. Chapman, Viva Books Pvt. Ltd, New Delhi, 1st Edition, 2001.
4. "A Textbook of Manufacturing Technology (Manufacturing Processes)", R.K. Rajput, Laxmi Publications Pvt. Ltd, New Delhi. Edition, 2007

Online Resources:

Unit No	Online Resource Link	Source
1	NPTEL :: Mechanical Engineering - NOC:Metal Cutting and Machine tools	NPTEL
2	Metal Cutting and Machine Tools - Course (nptel.ac.in)	NPTEL
3	https://onlinecourses.nptel.ac.in/noc24_me46/previe	NPTEL
4	Non-conventional energy Resources - Course (nptel.ac.in)	NPTEL
5	NPTEL :: Mechanical Engineering - NOC:Introduction to Abrasive Machining and Finishing Processes	NPTEL
6	https://nptel.ac.in./courses/112105211	NPTEL

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B. Tech Second Year (Mechanical Engineering)
Semester: IV
Subject: Entrepreneurship Development & Management
Course Code: 231MEMDML202

Course Plan

Course Title : Entrepreneurship Development &Small Enterprise Management	
Course Code : 231MEMDML202	**Semester :**
Teaching Scheme : L-T-P : 2-0-0	Credits : 2
Evaluation Scheme : ISE : 20	ESE Marks : **30**

Prerequisite: Basic understanding of English and Human Skills, Basics of Management Theory

Course Description:

This course equips students with the knowledge, skills, and critical thinking necessary to develop and manage new ventures. It explores the entrepreneurial mindset, opportunity identification, business planning, venture financing, marketing strategies, and the challenges and rewards of launching and growing a successful business.

Course Objectives:

1	Understand the core concepts of entrepreneurship and its role in economic development.
2	Craft a comprehensive business plan for a new venture.
3	Gain knowledge of various financing options for startups.
4	Analyze the challenges and risks associated with starting a business.
5	Cultivate the essential skills required for successful entrepreneurs.

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Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Critically analyze the entrepreneurial process from ideation to launch.	L 2
2	Apply financial analysis tools to assess the feasibility of a new venture.	L 3
3	Evaluate and source potential funding options for a startup.	L 2
4	Demonstrate an understanding of the legal and regulatory environment for startups.	L 2

Content	Hours
Unit 1: Introduction to Entrepreneurship	8
Definition and nature of entrepreneurship, The entrepreneurial mindset, Theories of entrepreneurship, Importance of entrepreneurship for economic development, Types of ventures (e.g., franchises, social enterprises), Identifying entrepreneurial opportunities (brainstorming techniques, market research), Global Trends in Entrepreneurship, Entrepreneurial Ecosystem, Entrepreneurial Mindset and Traits, Case studies of successful entrepreneurs	
Unit 2 : Entrepreneurial Motivation	7
Concept and meaning of entrepreneurial motivation, Process of entrepreneurial motivation, Motivating factors for entrepreneurs : External Influences on Entrepreneurial Motivation, Motivational Theories Applied to Entrepreneurship: Goal-setting theory, Equity theory, Achievement motivation theory, Classification of entrepreneurs, Economic barriers to entrepreneurship, Non-economic barriers to entrepreneurship	
Unit 3: Project Analysis	8
Meaning and definition of a project, Types and characteristics of projects, Project phases and life cycle, Project family tree, Feasibility analysis techniques : Market Feasibility, Technical Feasibility, Financial Feasibility, Organizational Feasibility, Importance of Project Analysis and Feasibility Assessment, Preparation of project reports: Components of a comprehensive project report	
Unit 4 : Small Enterprise Management	8

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Concept and meaning of small enterprise, Procedures for starting a small enterprise, Vital decisions during startup: project report preparation, choice of enterprise, market assessment , Staffing requirements and selection of personnel, Training and development in small enterprises, Determining financial requirements and sources of finances, Layout design and optimization, Marketing strategies and channel selection, Sales force development and management	

Course Content

Textbook:

1 "Entrepreneurship Development" by S.S. Khanka - Published by S. Chand Publishing.

2 "Entrepreneurship: Theory and Practice" by Vasant Desai - Published by Himalaya Publishing House.

3 "Entrepreneurship Development and Small Business Enterprises" by Poornima M. Charantimath - Published by Pearson Education India.

4 "Entrepreneurship Development: Small Business Enterprise" by Rajeev Roy - Published by Excel Books.

Reference Books:

1. "Entrepreneurship Development" by Dr. S.S. Khanka - Published by S. Chand Publishing, volume I.

2. "Entrepreneurship: Theory and Practice" by Dr. B.S. Bodla - Published by Kalyani Publishers, volume I

3. "Entrepreneurial Development" by Dr. Rajeev Roy - Published by Excel Books, volumeI

4 "Entrepreneurship Development and Management" by Dr. S. Anil Kumar - Published by Himalaya Publishing House, volume I.

NPTEL LINKS

https://onlinecourses.nptel.ac.in/noc21_mg70/preview
https://archive.nptel.ac.in/courses/110/106/110106141/

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B. Tech Second Year (Mechanical Engineering)
Semester: IV
Subject: Environmental Studies
Course Code: 231MEVECL202

Course Plan

Course Title : Environmental Studies	
Course Code : 231MEVECL202	**Semester : IV**
Teaching Scheme : L-T-P : 2-0-0	Credits : 2
Evaluation Scheme :	ESE Marks : **50**

Prerequisites: Understanding of Environmental Education course

Course Description:

The main objective of course is to create awareness among students regarding environmental issues and its impact on society. Knowledge regarding environmental components, its degradation and protection of environment is need for sustainable future ahead.

Course Objectives:

1	Understand the scope and importance of Environmental Studies and sustainable development
2	Understand connection between environmental health and developmental activities
3	Understand the importance of Environmental Management for its protection through technical and legislative point of view
4	Acquire problem solving skills through visits to different locations, identifying the Environmental problems and proposing solution for societal benefits

Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Understand the scope and importance of Environmental awareness and Sustainable development	L2
2	Understand various modes of Environmental management through technology and legislation	L3
3	Understand various Environmental issues due to development	L3
4	Acquire problem solving attitude through actual field experience, reporting it in the form of Field project work	L3

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Content	Hours
Unit 1 Our Environment	05
Introduction to Environment, Scope of Environmental studies, importance of environmental awareness (1) Concept of sustainability, Sustainable Development- history and Goals, environmental ethics, Sustainability ethics (3) Population growth of world and reduced health content of the environment (1)	
Unit 2 Development and Environmental health	10
I. **Natural resources** (8) Types (renewable and non-renewable), developmental benefits Forest- Benefits, problems (Deforestation) Biodiversity-- importance, threats, conservation Ecosystems- importance, problem associated with major ecosystems, ecological restoration Air- Benefits, problems (Pollution, climate change) Water- Benefits, problems (Depletion, pollution) Soil/ Land- Benefits, problems (Degradation, loss of fertility, desertification) Mineral- Benefits, problems (Mining, over exploitation, depletion, pollution) Energy resources- Benefits, problems (depletion, energy crisis) II. **Urbanization and Environmental health (2)** Urban problems, Solid waste- Effects of MSW, Plastic waste, Hazardous waste, E- waste	
Unit 3 Environmental Management	10
Renewable energy technologies- current, new (Bio gas, Bio fuel, hydrogen, etc.) (1) Pollution abetment – 5R, ZLD, carbon credit, bio remedies (1) Soil/ land reclamation, Sustainable agriculture (1) ***Concept of EIA, Environmental audit, ISO certification (ISO 14001) (2)*** Role of CPCB and MPCB in Environmental protection of India (1) Emerging technologies for environmental management- GIS, Remote sensing, Smart bin, IoT integration, Waste-to-Energy Technologies, Recycling Automation, Advanced Data Analytics, Circular Economy Practices, Sustainable Packaging Solutions, Community Engagement and Education, Decentralized Waste Treatment, Zero-Waste Initiatives, Legislative and Regulatory Changes (2) Environmental legislation- Environmental Protection Act, Air Act, Water Act, Solid waste Management Act, Hazardous waste Management Rule, E- Waste (Management) Rules, 2022 (2)	
Unit 4 Field project work	05
Case studies based on site visit (Each candidate has to go for field visit and complete a project work on Environmental issues and probable solutions)	

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Textbook:

1. Handbook of Environmental Studies by Dr. G. R. Parihar, Publisher: Satyam Publishers and Distributors (1 January 2013) ISBN-10 : 9382664408 ISBN-13 : 978-9382664406
2. Environmental Studies by Anubha Kaushik, New Age International Private Limited (1 January 2007) ISBN-10 : 8122422403 ISBN-13 : 978-8122422405
3. Introduction to Environmental Engineering and Science 3e, by Masters, Publisher : Pearson Education India; 3rd edition (1 January 2015) ISBN-10 : 9332549761 ISBN-13 : 978-9332549760
4. Solid Waste Management in developing countries, by Bhide A. D. and Sundersen B. B.- Indian National Scientific Documentation Centre, New Delhi

Reference Books:

1. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I &II, Environmental Media
2. Ecology And Environment Pb, by P. D. Sharma, Rastogi Publications (1 January 2011)

Online Resources:

Environmentat English Book 1-3-2022 Final Corrected copy_compressed.pdf

Manual on Municipal Solid Waste Management- Ministry of Urban Development, Govt. of India

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B. Tech Second Year (Mechanical Engineering)
Semester: IV
Subject: Operation Management
Course Code: 231MEHSSML202

Course Plan

Course Title : Operation Management	
Course Code : 231MEHSSML202	**Semester : IV**
Teaching Scheme : L-T-P : 2-0-0	Credits : 2
Evaluation Scheme : ISE Marks: 20	ESE Marks : **30**

Prerequisite: Exposure to MS- Excel, Manufacturing Resources planning and control, Quantitative models in Operations.

Course Description:

Operations management (OM) is a specialist field that improves productivity, quality, cost, and delivery schedule while giving value to the end customer. Inventory management, vendor management, purchase management, and enterprise resource planning (ERP) are all part of it, and they all help a company's supply chain work smoothly.

Course Objectives:

1	To expose a student of Management to operations principles.
2	To understand basic operating principles in product and service industry.
3	To provide an in depth study of the various business process, analyze operations, production planning and strategic management.
4	Develop ability to analyze and address problem related to the design, planning, control, and improvements of manufacturing and service operations.

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Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Understand basic terms and concepts related to Production & Operations Management	L2
2	Implement effective plant location & layout for the organization	L3
3	Solve numerical on selective Inventory Control Techniques to Identify the best suitable technique for organization	L3
4	Use a typical Supply Chain Model for a product / service and analyze its linkages with Customer Issues and Business Issues in a real world context	L3

Content	Hours
Unit 1: An Overview of Operations Management	**08**
Concept of Operations Management, Types of Production System, Objectives & Scope of Operations Management, Operations in Service Sector, Manufacturing Operations (Goods) versus Service Operations, Decisions in Operations Management. Recent Trends in Operations Management.	
Unit 2: Operations System Design	**08**
Facility Location: Importance, Procedure of Finalizing Location Decisions, Factors Affecting Location Decision. **Facility Layout:** Objectives, Importance, Types, Factors Influencing Plant Layout. **Material Handling:** Objectives, Scope, Principles of Material Handling, Classification of MH Equipment, Selection of MH Equipment.	
Unit 3 : Production Planning & Materials Management	**08**
Meaning, Objectives, Functions of Production Planning & Control. Make or Buy Decision. Inventory Management: Meaning, Types of Inventory, Objectives of Inventory Management, Selective Inventory Control Techniques: EOQ, ABC	
Unit 4 : Supply Chain & Quality Management	**06**
Supply Chain Management: Concept, Definition of SC, Evolution of SCM, Functions and Activities of SCM, Logistics Vs SC. Quality Management: Meaning& Definitions of Quality Dimensions of Quality, Quality Control Tools, ISO Quality Certifications.	

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Textbook:

1 "Theory & Problems in Production & Operations Management- S N Chary, Tata McGraw Hill" ,

2 S. A. Chunawalla and D. R. Patel: Production and Operations Management, Himalaya Publishing House, Mumbai.

3 R. Paanneerselvam, Production and Operations Management, Eastern Economy Edition, New Delhi

4 John O Mcclain And L.Joseph Thomas: Operations Management- Production of Goods And Services, Prentice Hall India, New Delhi.

Reference Books:

1. N.D. Vohra: Quantitative Techniques in Management (2021), Tata MacGraw Hill

2. J.K. Sharma: Operations Research Problems and Solutions (2017), Macmillan India.

3. Production and Operations Management-S N Chary, Tata McGraw Hill

4. Hamdy A. Taha: Operations Research (2019), Pearson Education.

Online Resources:

Unit No	Online Resource Link	Source
1	**https://nptel.ac.in/courses/110101167**	**NPTEL**
2	**https://nptel.ac.in/courses/110101438**	**NPTEL**
3	**https://nptel.ac.in/courses/110105095**	**NPTEL**
4	**https://nptel.ac.in/courses/110101436/ https://nptel.ac.in/courses/110104080**	**NPTEL**

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B. Tech Second Year (Mechanical Engineering)
Semester: IV
Subject: Basics of Finance
Course Code: 231MEAECL201

Course Plan

Course Title : Basics of Finance for Engineers	
Course Code : 231MEAECL201	**Semester : IV**
Teaching Scheme : L-T-P : 2-0-0	Credits : 2
Evaluation Scheme : ISE : 20	ESE Marks : **30**

Prerequisite: Basic of Mathematics

Course Description:

This course provides a comprehensive understanding of financial management principles and taxation concepts essential for effective business decision-making. Students will learn about various aspects of capital management, financial statement analysis, cost accounting techniques, and the Goods and Services Tax (GST) framework.

Course Objectives:

1	To Understand capital management, reserves, and surplus in financial decision-making.
2	To Analyze financial statements using various tools to assess organizational performance.
3	To Understand insights into cost accounting principles, including classification and analysis.
4	To Understand the GST framework, including registration and compliance.

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Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Understand capital and reverses	L 2
2	Draw and analyze financial statements	L 3
3	Understand industrial costing	L 2
4	Understand GST	L 2

Course Content

Content	Hours
Unit 1 : Introduction to Capital, Reserves and Surplus	8
Capital Definition and Classification of Capital, Authorized, Issued, Subscribed, and Paid-up Capital, Equity Capital: Common Stock and Preference Shares, Debt Capital: Bonds, Debentures, and Loans, Sources of Finance: Internal Sources: Retained Earnings, Depreciation Funds, External Sources: Equity Financing, Debt Financing Short-term Financing: Bank Loans, Trade Credit, Long-term Financing: Equity Shares, Debentures, Venture Capital, **Reserves and Surplus:** Purpose and Importance of Reserves, Types of Reserves: Revenue Reserves, Capital Reserves Building Reserves for Contingencies and Growth, Surplus: Definition and Utilization Strategies,	
Unit 2 : Analysis of Financial Statements	8
Meaning, Objectives and Limitations of Financial Statement Analysis. , Tools for Financial Statement Analysis , Balance Sheet: Vertical Balance Sheet (Simple Numerical) , Comparative Statement: Introduction, Methods and Steps for Preparation (Example of Simple Statement) , Common Sized Statement: Introduction, Methods and Steps for Preparation(Example of Simple Statement) , Cash Flow Statement: Importance Steps for Preparation & Use (Example of Simple Statement) , of Accounting Ratios: Meaning, Objectives and Classification	

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Unit 3 : Cost Accounting	
Introduction to Cost Accounting: Definition and Scope of Cost Accounting, Objectives and Importance of Cost Accounting, Relationship with Management Accounting and Financial Accounting, **Elements of Cost:** Direct Costs vs. Indirect Costs, Material Cost, Labor Cost, and Overhead Cost, **Classification of Costs:** Variable Costs, Fixed Costs, Semi-variable Costs, Prime Cost and Factory Cost: Definition and Components of Prime Cost, **Total Cost and Selling Price:** Determination and Analysis, Markup vs. Margin, Setting Selling Price: Cost-Plus Pricing Method, **Process Costing and Production Cost**: Process Costing: Concept and Application, Calculation of Equivalent Units, Production Cost, Cost Control :Controlling Overhead Cost, Activity-Based Costing, Labor Cost	**8**
Unit 4 : Goods & Service Tax (GST)	
Introduction to Goods and Services Tax (GST): Definition and Overview of GST, Objectives and Benefits of GST Implementation, Historical Background and Evolution of GST Structure and Components of GST: **Types of GST:** Central Goods and Services Tax (CGST), State Goods and Services Tax (SGST), Integrated Goods and Services Tax (IGST), **GST Registration and Compliance:** Mandatory and Voluntary GST Registration, GSTIN (GST Identification Number), Filing of GST Returns and Compliance Requirements, Exemptions and Composition Scheme, GST Rates and Classification, **Future Trends and Developments in GST:** Recent Amendments and Updates in GST Laws, Emerging Trends in GST Compliance and Administration, Potential Impact of GST on Business and Economy	**6**

Textbook:

1. "Financial Management: Theory & Practice" by Prasanna Chandra, Mc Grow Hill Publication 11th Edition,
2. "Cost Accounting: Principles and Practice" by M.N. Arora, Vikas Publishing House 13th Edition
3. "GST: A Practical Approach" by Vandana Bangar and Yogendra Bangar, Aadhya Prakashan Pvt Ltd, 1 Ed 2017
4. "Financial Statement Analysis: A Practitioner's Guide" by R. C. Mittal and S. N. Maheshwari, Publisher: Sultan Chand & Sons,5th Edition,

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Reference Books:

1. "Financial Management" by Rajiv Srivastava and Anil Misra, Oxford University Press
2. "Financial Statement Analysis" by K. R. Subramanyam, Publisher: McGraw Hill Education, 3rd Edition
3. "GST Made Easy" by S.P. Gupta and Mahesh Gour, Publisher: S Chand & Co Ltd.

Online Resources:

Unit No	Online Resource Link	Source
1	https://onlinecourses.nptel.ac.in/noc24_ec01/preview	Swayam
2	https://archive.nptel.ac.in/courses/110/107/110107073/	NPTEL
3	https://archive.nptel.ac.in/courses/110/107/110107093/	NPTEL
4	https://onlinecourses.swayam2.ac.in/ugc19_hs34/preview	Swayam

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B. Tech Second Year (Mechanical Engineering)
Semester: IV
Subject: Marketing Management
Course Code: 231MEOECL202

Course Plan

Course Title : Marketing Management	
Course Code : 231MEOECL202	**Semester :IV**
Teaching Scheme : L-T-P : 2-0-0	Credits : 2
Evaluation Scheme : ISE Marks: 20	ESE Marks : **30**

Prerequisite: (Write course prerequisites)

Course Description:

This course is designed to provide an understanding of the nature and role of marketing management within organizations. This purpose of this course is to provide the students frameworks, techniques and strategies to evaluate marketing, sales,pricing,promotion and advertising strategies. Lecture from class slides,Case studies, class discussion, marketing videos, tests, marketing plan will be the tools utilized to accomplish the learning objectives.

Course Objectives:

1	To introduce the concept of market and marketing.
2	To give idea about Product Pricing.
3	To introduce the various marketing strategies.
4	To study Advertising Sales Promotion and Distribution strategies.

Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	State the role and functions of marketing within a range of organizations.	L
2	Describe buying behaviour and Marketing segmentation.	L
3	identify various product pricing and market planning strategy.	L
4	Learn promotion and advertising strategies.	L

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Content	Hours
Unit 1 : Introduction to marketing	7
Marketing Process: Definition, Marketing process, dynamics, needs, wants and demands, value and satisfaction, marketing concepts, environment, mix. Philosophies, selling versus marketing, organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy	
Unit 2 : Buying Behaviour and Market Segmentation	7
Buying Behaviour and Market Segmentation: Major factors influencing buying behaviour, buying decision process, business buying behaviour. Segmenting consumer and business markets, market targeting.	
Unit 3 : Product Pricing and Marketing Planning and Strategy Formulation	8
Product Pricing and Marketing Research: Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process of marketing research. Marketing Planning and Strategy Formulation: Components of marketing plan-strategy formulations and the marketing process, implementations, portfolio analysis, BCG, GEC grids.	
Unit 4 : Advertising Sales Promotion and Distribution	8
Advertising Sales Promotion and Distribution: Characteristics, impact, goals, types, and sales promotions – point of purchase – unique selling proposition. Characteristics, wholesaling, retailing, channel design, logistics, and modern trends in retailing.	

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Textbook:

1 Marketing Research, Text, Applications and Case Studies, Majumdar R., New Age International (P), 1991

2 Marketing Management: Planning, Implementation and Control, Ramaswamy V.S. & Namkumari S, Macmillan India Limited, 2002

3 Marketing Research, Robert, Prentice Hall of India,1999

4 Marketing management, T N Chabra and S K Grover, Dhanpat Rai, 2007

Reference Books:

1. Marketing Management: Analysis, Planning, Implementation and Control, Kotler P, Prentice Hall of India,1993

2. Fundamentals of Marketing, Stanton W.J., Etzel M.J. & Walker B.J, McGraw Hill International Edition, 1994

3. 'Principles of Marketing', Kotler P. and Armstrong G., Prentice Hall of India – 2000

4. 'Industrial Marketing Management', Govindarajan, M., Vikas Publishing Pvt. Ltd. – 2003

~~Online Resources:~~

Unit No	Online Resource Link	Source
1	Marketing Management - I - Course (nptel.ac.in)	**NPTEL**
2	Consumer Behaviour - Course (nptel.ac.in)	**NPTEL**
3	Innovation in Marketing and Marketing of Innovation - Course (nptel.ac.in)	**NPTEL**
4	NPTEL :: Management - NOC:Sales and Distribution Management	**NPTEL**

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B. Tech Second Year (Mechanical Engineering)
Semester: IV
3D Modeling
Course Code: 231MEVSECL201

Course Plan

Course Title : 3D Modeling	
Course Code : 231MEVSECL201	**Semester : IV**
Teaching Scheme : L-T-P : 1-0-0	Credits : 1
Evaluation Scheme :	INT Marks : **25**

Prerequisite: Engineering Graphics , Fundamentals of drawings, Machine Drawing, Auto CAD

Course Description:

The student will emphasize the use of CAD on computer workstations as a major graphical analysis and design tool. Students will develop design skills, and practice applying these skills. Hands-on creativity, teamwork, and effective communication are emphasized.

Course Objectives:

1	Understand Parametric Modeling Fundamentals and Procedure.
2	Understand the use of geometrical and dimensional constraints.

Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
CO 1	Understand Parametric Modeling Fundamentals and Procedure	L2
CO 2	Understand the geometrical and dimensional constraints.	L3

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Course Content

Content	Hours
Unit 1: Introduction to CAD Introduction to CAD, Introduction to different CAD software, Introduction tographical user interface (GUI), Application and modification of contents and dimensions, Concept of feature based and parametric modeling	4
Unit 2: Sketching 2D sketching of elements like line, circle, arc, spline etc Geometrical constraints like parallel, perpendicular, co-incident, vertical, horizontal, tangent, symmetric etc., Dimensional Constraints	8

Textbook:

1. N. D. Bhatt, "Machine Drawing", Charotor Publication House, Bombay, 46th Edition.
2. CAD / CAM, Theory and Practice by Zeid, (TMH)
3. CAD / CAM, Principles & Applications by P. N. Rao (TMH)

Reference Books:

1. K. L. Narayana, "Machine Drawing", New Age Publication
2. K. Venugopal, "Engineering Drawing and Graphics", New Age Publication
3. R. K. Dhawan, "A text book of Engineering Drawing", S. Chand and Co.
4. W. J. Luzadder, "Fundamentals of Engineering Drawing", Prentice Hall of India.
5. N. B. Shaha and B. C. Rana, "Engineering Drawing", Pearson Education, 2nd Edition.

Online Resources:

Sr. No	Online Resource Link	Source
1	https://www.udemy.com/course/siemens-nx unigraphics-ug-basic-to-advance-3d-modelling/?couponCode=ST15MT31224	**Udemy.com**

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B. Tech Third Year (Mechanical Engineering)
Semester: IV
Dynamics of Machines Lab
Course Code: 231MEPCCP205

Course Plan

Course Title : Dynamics of Machines Lab	
Course Code : 231MEPCCP205	**Semester : IV**
Teaching Scheme : L-T-P : 0-0-2	Credits : 1
Evaluation Scheme :	INT Marks : 25 POE Marks : 25

Prerequisite: Engineering physics, engineering mathematics, fundamentals of engineering mechanics, Kinematics of mechanism and machines.

Course Description:

This course is the deal with an introduction to gear geometry, generation of gear tooth profile and phenomena of interference. Study and experiment to find inertia forces and torques in components, static and dynamic balancing of Rotary and reciprocating masses in machines, effect of gyroscopic couple in machinery, free and force vibrations of single degree of freedom system and two degree of freedom systems with and without damping.

Course Objectives:

1	To study the gear geometry, gear profile, theory of gears and various types of gear trains used for transmission of motion and power.
2	To study gyroscopic effects on vehicles, aero-plane, ship, four Wheeler and two Wheeler.
3	To study static and dynamic forces and balancing of Rotary and reciprocating masses.
4	To Study basic concepts of vibration analysis
5	To Acquaint with the principles of vibration measuring instruments

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Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Draw gear tooth profile using rack and cutter method	L3
2	Explain the concept of gyroscope on vehicles, aero-plane, ship, two and four-Wheeler.	L2
3	Analyze static and dynamic forces, moment of inertia of mechanical body by various suspension methods and torque in mechanisms.	L4
4	Apply static and dynamic balancing principles to the Rotary and reciprocating masses.	L3
5	Calculate and examine vibratory response of mechanical element/system	L4
6	Conduct measurements of different vibration parameters.	L3

Sr. No.	Experiment/Assignment List	Type	Hrs.
1	Generation of involute profile using rack cutter method.	O	2
2	Experiment on torque measurement in epicyclic gear train	O	2
3	Experiment to find gyroscopic couple on Motorized Gyroscope	O	2
4	Determination of moment of inertia using bi filler suspension system	O	2
5	Determination of moment of inertia using tri filler suspension system	O	2
6	Determination of Moment of inertia of connecting rod by compound pendulum method	O	2
7	Experiment on balancing of Rotary masses (static and dynamic)	O	2
8	Balancing of reciprocating masses	S	2
9	Experiment on equivalent spring mass system	O	2
10	Determination of logarithmic decrement for single DOF damped system	O	2
11	Experiment on study of forced vibration characteristics	O	2
12	Measurement of vibration parameters using vibration measuring instruments	O	2

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S-STUDY, O-OPERATIONAL

Textbook:

1 "Theory of Machines", Rattan S.S, Tata McGraw Hill New Delhi, 5thKindle Edition.2019.

2 "Theory of Machines", V.P. Singh, Dhanpat Rai and Sons. 6th Edition

3 "Mechanical Vibrations", Singiresu S.Rao , Pearson Education, ISBM –81-297-0179-0 - (2018).

4 Mechanical Vibrations", G. K. Grover, Published by Nemchand and Brothers, Roorkee

5 "Mechanical Vibrations", Dr. V. P. Singh, Published by S. Chand and Sons New Delhi.

Reference Books:

1. Theory of Machines and Mechanism", Shigley, McGraw Hill, New York, 4 th Edition,2014

2. "Theory of Machines", Dr. R.K. Bansal, Laxmi Publication.

3. "Theory of Machines and Mechanism", G.S. Rao and R.V. Dukipatti, New Age, Delhi.

4. "Mechanical Vibration",Austin Church, Wiely Eastern. 2nd Edition.

5. "Mechanical Vibrations", J.P. Den Hartog, Tata McGrawhill Book Company Inc., 4th Edition.

Online Resources:

Unit No	Online Resource Link	Source
1	https://archive.nptel.ac.in/courses/112/106/112106270/	NPTEL
2	https://archive.nptel.ac.in/courses/112/106/112106270/	NPTEL
3	https://nptel.ac.in/courses/116102012	NPTEL
4	NPTEL :: Mechanical Engineering - NOC:Introduction to Mechanical Vibration	NPTEL
5	NPTEL :: Mechanical Engineering - NOC:Introduction to Mechanical Vibration	NPTEL
6	NPTEL :: Mechanical Engineering - NOC:Introduction to Mechanical Vibration	NPTEL

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Head
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Kolhapur

B. Tech Second Year (Mechanical Engineering)
Semester: IV
Subject: Machine Tools and Processes Lab
Course Code: 231MEPCCP206

Course Plan

Course Title : Machine Tools and Processes Lab	
Course Code : 231MEPCCP206	**Semester :IV**
Teaching Scheme : L-T-P : O-O-2	Credits : 1
Evaluation Scheme :	INT Marks : 25

Prerequisite: Engineering Graphics, Basic Mechanical Engineering

Course Description:

The course Workshop practice III is focused on the study of various types of metal cutting processes and machine tools. It includes the study of general purpose machine tools such as center lathe, drilling, milling machines along with their accessories and attachments. This course intends to bring the competency in the students to identify and select and use proper machine tools, proper cutting tools, types of operations, and use of accessories and attachments on the machine tools.

Course Objectives:

1	To impart basic knowledge of Machine layout, installation of Machine Tools, selection of Tools.
2	To understand Lathe Machine, Drilling Machine, Milling Machine.
3	To study machining operations and prepare Job with its process sheet on Lathe machine.
4	To study basics of CNC and VMC Machine

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Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Understand Machine layout, method of Machine Tool installation, selection of Tools for various machining operation.	L
2	Understand Construction, Mechanism and Application of Lathe Machine, Drilling Machine, and Milling Machine.	L
3	Demonstrate effect of variables such as speed, feed and depth of cut on machining process and produce Job with plain turning, taper turning, external threading and knurling operation along with its process sheet	L
4	Understand basics of CNC and VMC Machine along with simple program using G & M codes.	L

Course Content

Sr. No.	Experiment/Assignment List	Type	Hrs.
1	Machine layout, existing machine specifications, Installation procedure of Machine Tools.	S	1
2	Study & Demonstration of single and multi-point cutting tools like turning tool, twist drill, reamer, milling cutter, hacksaw,grinding wheel etc	S	1
3	Introduction of linear measuring instruments-vernier caliper & micrometer.	S	1
4	Prepare a working drawings, understand operational symbols and Select cutting parameters like cutting speed, feed, depth of cut, and tooling for various machining operations and prepare a process sheet.	S	1
5	One Job of MS material plain turning, facing, Taper turning, step turning, external threading, knurling operation.(A)	O	4
6	To perform facing, plain turning, step turning, eccentric turning and drilling operation on the given work piece (B)	O	2
7	Prepare a part program using G code and M code.	O	1
8	One Al job -plain milling,profile milling,drilling	O	2
9	Industrial visit to study gear manufacturing processes or thread manufacturing Processes	-	-

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S-STUDY, O-OPERATIONAL

Textbook:

1. "A Textbook of Production Technology (Manufacturing Processes)", P.C. Sharma, S. Chand and Company Pvt. Ltd, New Delhi.7thEdition, 2010
2. "Workshop Technology vol. II", B.S. Raghuvanshi, Dhanapat Rai Publications Pvt. Ltd, New Delhi.10th Edition, 2000

Reference Books:

1. "Machine Tools and Manufacturing Technology", Steve F. Krar, Mario Rapisarda, Albert F
2. HMT Hand book- Production Technology Roy A. & Linberg- "Processes and materials of manufacturing", Prentice Hall of India Delhi.
3. Campbell J.S.: Principles of manufacturing Materials and Processes, McGraw-Hill, New York

Online Resources:

Unit No	Online Resource Link	Source
1	https://nptel.ac.in/course.html	NPTEL
2	https://nptel.ac.in/courses/112/107/112107219/	NPTEL
3	https://nptel.ac.in/courses/112/104/112104195/	NPTEL
4	https://nptel.ac.in/courses/112/105/112105127/	NPTEL
5	https://nptel.ac.in/courses/112/105/112105211/	NPTEL
6	https://nptel.ac.in/courses/112/105/112105212/	NPTEL

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B. Tech Second Year (Mechanical Engineering)
Semester: IV
3D Modeling Lab
Course Code: 231MEVSECP201

Course Plan

Course Title : 3D Modeling Lab	
Course Code : 231MEVSECP201	**Semester : IV**
Teaching Scheme : L-T-P : 0-0-2	Credits : 1
Evaluation Scheme :	POE Marks : 25

Prerequisite: Engineering Graphics , Fundamentals of drawings, Machine Drawing, Auto CAD

Course Description:

The student will emphasize the use of CAD on computer workstations as a major graphical analysis and design tool. Students will develop design skills, and practice applying these skills. Hands-on creativity, teamwork, and effective communication are emphasized.

Course Objectives:

1	Understand Parametric Modeling Fundamentals and Procedure.
2	Develop an ability to create constrained 2-D Sketches.
3	Create 3 D Models of machine components.
4	Create assembly model with drafting.

Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
CO 1	**Understand** Parametric Modeling Fundamentals and Procedure	L2
CO 2	**Develop** an ability to create constrained 2-D Sketches	L3
CO 3	**Prepare** 3 D Models of machine components	L3
CO 4	**Prepare** assembly model with drafting.	L3

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Course Content

Content	Hours
Unit 1: Part Modeling -I Conversions of 2D into 3D modeling, Extrude, revolve commands, Boolean operations, hole features, editing features and transformation features.	12
Unit 2: Part Modeling -II Introduction to import and export of 3D models, Physical properties like volume, surface area, center of gravity etc of 3 D model.	12
Unit 3: Assembly Modeling Introduction to the assembly environment, creating assembly and sub-assemblies, Editing and modifying assembly relationships, Creating exploded view of the assembly	10
Unit 4: Drafting Generation of Orthographic views [working drawings] from 3D model. Generation of title block in sheet. Orthographic views of assembly drawings, generation of Bill of Materials (BOM). Plotting of drawings.	10

Sr. No.	Name of Assignments	Type	Hrs.
1	Prepare two 2 D drawings in Sketcher environment- Sketch 1	O	2
2	Prepare two 2 D drawings in Sketcher environment- Sketch 2	O	2
3	Prepare two 2 D drawings in Sketcher environment- Sketch 3	O	2
4	Prepare 3 D models using 3 D modeling features (Model 1)	O	2
5	Prepare 3 D models using 3 D modeling features (Model 2)	O	2
6	Prepare 3 D models using 3 D modeling features (Model 3)	O	2
7	Prepare 3 D models using 3 D modeling features (Model 4)	O	2
8	Prepare 3 D models using 3 D modeling features (Model 5)	O	2
9	Drafting of above 3D models.	O	2
10	Drafting of above 3D models.	O	2
11	Prepare assembly of 5-6 components. (Assembly-1)	O	2
12	Prepare assembly of 5-6 components. (Assembly-2)	O	2
13	Drafting of Assembly-1 along with exploded view	O	2
14	Drafting of Assembly-2 along with exploded view	O	2
15	Retrieving physical properties for different component materials.	O	2

S-STUDY, O-OPERATIONAL

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Textbook:

4. N. D. Bhatt, "Machine Drawing", Charotor Publication House, Bombay, 46th Edition.
5. CAD / CAM, Theory and Practice by Zeid, (TMH)
6. CAD / CAM, Principles & Applications by P. N. Rao (TMH)

Reference Books:

6. K. L. Narayana, "Machine Drawing", New Age Publication
7. K. Venugopal, "Engineering Drawing and Graphics", New Age Publication
8. R. K. Dhawan, "A text book of Engineering Drawing", S. Chand and Co.
9. W. J. Luzadder, "Fundamentals of Engineering Drawing", Prentice Hall of India.
10. N. B. Shaha and B. C. Rana, "Engineering Drawing", Pearson Education, 2nd Edition.

Online Resources:

Sr. No	Online Resource Link	Source
1	https://www.udemy.com/course/siemens-nx-unigraphics-ug-basic-to-advance-3d-modelling/?couponCode=ST15MT31224	**Udemy.com**

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INDUSTRIAL AUTOMATION AND ROBOTICS (HONOURS) Semester-IV												
Sr. No	Course Code	Course Type	Name of the Course	Teaching Scheme Per Week			Credits	Total Marks	Evaluation scheme			
				Lecture	Tutorial	Practical			Type	Max. Marks	Min. Marks for Passing	
01	231MEHCL201	HC	Fundamentals of Robotics	3	-	-	3	100	ISE	20	20	40
									MSE	30		
									ESE	50	20	
02	231MEHCP201	HC	Fundamentals of Robotics Lab	-	-	2	1	25	INT	25	10	10
Total				03	00	02	04	125	Total Credits: 04			
									Total Contact Hrs.: 05			

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B. Tech Second Year (Mechanical Engineering)
Semester: IV

Fundamentals of Robotics
Course Code: 231MEHCL201

Course Plan

Course Title : **Fundamentals of Robotics**	
Course Code : 231MEHCL201	**Semester :IV**
Teaching Scheme : L-T-P : **3-0-0**	Credits : **3**
Evaluation Scheme : ISE + MSE Marks : **20 + 30**	ESE Marks : **50**

Prerequisite: Fundamentals of Electrical and Electronics Engineering

Course Description:

This course aims to familiarise students with basic terminologies of the robotics sciences and essential knowledge required to get started in the field of Robotics

Course Objectives:

1. To provide Basic knowledge of Robots, their types and operations
2. To provide information about Sensors Used in Robotics
3. To make students aware of various types of actuators for robotics
4. To develop student knowledge about Various drives and motors used in robots
5. To provide overview of Controllers and basics of Programming Languages for Robotics
6. To provide overview of Grippers, Manipulators and Various types of accessories used in Robots

Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
1	Understand basics of Robots and its Anatomy	L2
2	Select Suitable Sensors for Robotics	L2
3	Understand Various types of Drives used in Robotics	L2
4	Discuss Different Control Systems and Controllers	L2
5	Discuss Grippers or Manipulators used in Robots	L2
6	Explain Allied fields related to Robotics	L2

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Course Content

Content	Hours
Unit 1: Introduction to Robotics Brief History, Basic Concepts of Robotics such as Definition, three laws, Robot anatomy, DOF, Misunderstood devices etc., Evolution of Robots, Classification of Robotic systems on the basis of various parameters such as work volume, type of drives, applications etc., Related parameters i.e. resolution, accuracy, repeatability, dexterity, compliance, RCC device etc, Industrial applications of robot.	08
Unit 2: Sensors Used in Robotics Basics of Sensors, Classification of Sensors based on sensing entity, operating parameters, output parameters etc., Applications of Sensors, Characteristics of Sensing Devices, Selection of Sensors, Need for Sensors and vision System in working and control of a robot.	07
Unit 3: Drives and Actuators used in Robotics Drive - Types of Drives, Types of transmission systems, Actuators – Hydraulic Actuators, Pneumatic Actuators, selection of Actuators while designing a robot system. Motors – DC Motors, Servo Motors, Stepper motors etc.	06
Unit 4: Control for Robotics Control Systems: introduction to Open loop and Closed loop control systems, Types of Controllers, PLC – Introduction, Types, applications, advantages, disadvantages and selection, NC Controller- Introduction, Types, applications, advantages, disadvantages and Selection	05
Unit 5: Grippers and Manipulators for Robotics: Grippers for Robotics - Types of Grippers, Guidelines for design for robotic gripper, Force analysis for various basic gripper system. Manipulators for Robotics- Types of manipulators, Guidelines for design and selection of manipulators	06
Unit 6: Allied Topics in Robotics: Socio-Economic aspect of robotization. Economical aspects for robot design, Safety for robot and standards, Introduction to Artificial Intelligence, AI techniques, Need and application of AI, New trends & recent updates in robotics	08

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Textbook:

1. "Introduction to Robotics" 2nd edition, S. K. Saha, TATA McGraw Hills Education (2014)
2. "Robotics: Fundamental concepts and analysis", Asitava Ghoshal, Oxford University Press (2006

Reference Books:

1. "Fundamentals of Robotics", Dilip Kumar Pratihar, Narosa Publishing House, (2019)
2. "Robotics and Control", R. K. Mittal, I. J. Nagrath, , TATA McGraw Hill Publishing Co Ltd, New Delhi (2003)
3. "Introduction to Robotics – Analysis, Control, Applications", S. B. Niku, John Wiley & Sons Ltd., (2020)
4. "Fundamentals of Robotic Mechanical Systems Theory Methods and Algorithms", J. Angeles, Springer (1997)
5. "Industrial Robotics 2nd edition", Mikell Groover, Mitchell Weiss, Roger N. Nagel, Nicholas Odrey, Ashish Dutta, SIE, McGraw Hill Education (India) Pvt Ltd (2012)

Online sources:

1. https://nptel.ac.in/courses/107106090
2. https://nptel.ac.in/courses/108108147

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B. Tech Second Year (Mechanical Engineering)
Semester: IV

Fundamentals of Robotics Lab
Course Code: 231MEHCP201

Course Plan

Course Title : **Fundamentals of Robotics Lab**	
Course Code : 231MEHCP201	**Semester : IV**
Teaching Scheme : L-T-P : **0-0-2**	Credits : **1**
Evaluation Scheme :	INT Marks : **25**

Prerequisite: Fundamentals of Electrical and Electronics Engineering.

Course Description:

The course is focused on study, demonstration and hands on experience on Basic Robotic Systems, Anatomy of Robots, various sensors, actuators and drives used in Robotics.

Course Objectives:

1	To teach Basics of Robots, their types and operations
2	To demonstrate various Sensors Used in Robotics
3	To demonstrate various types of actuators for robotics
4	To demonstrate Various drives and motors used in robots

Course Outcomes (COs):

At the end of the course the student should be able to:

CO	Statement	BTL
CO222.1	**Understand** Robot basics of Robots and its Anatomy	L2
CO222.2	**Select** Suitable Sensors for Robotics	L2
CO222.3	**Understand** Various types of Drives used in Robotics	L2
CO222.4	**Discuss** Different Control Systems and Controllers for Robots	L2
CO222.5	**Discuss** Grippers or Manipulators used in Robots	L2

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List of Assignments/Experiments			
Sr. No.	**Name of Assignments/Experiment**	**Type**	**Hrs.**
1	Study of 6-axis Robotic Arm	S	2
2	Study of Robot Anatomy	S	2
3	Demonstration of Capacitive and Inductive Proximity Sensors	O	2
4	Demonstration of Optical and Laser Sensors	O	2
5	Demonstration of Pressure Sensor	O	2
6	Demonstration of Temperature Sensor.	O	2
7	Demonstration of Magnetic Sensors	O	2
8	Demonstration of Magnetic Switches	O	2
9	Demonstration of Hydraulic Actuators	O	2
10	Demonstration of Pneumatic Actuators	O	2
11	Demonstration of Various Drive Motors	O	2
12	Assignment: Study of Drive Systems used in Robotics	S	2

S-STUDY, O-OPERATIONAL

Textbook:

1. "Introduction to Robotics" 2nd edition, S. K. Saha, TATA McGraw Hills Education (2014)
2. "Robotics: Fundamental concepts and analysis", Asitava Ghoshal, Oxford University Press (2006

Reference Books:

1. "Fundamentals of Robotics", Dilip Kumar Pratihar, Narosa Publishing House, (2019)
2. "Robotics and Control", R. K. Mittal, I. J. Nagrath, , TATA McGraw Hill Publishing Co Ltd, New Delhi (2003)
3. "Introduction to Robotics – Analysis, Control, Applications", S. B. Niku, John Wiley & Sons Ltd., (2020)

Online sources:

1. https://nptel.ac.in/courses/107106090
2. https://nptel.ac.in/courses/108108147

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B. Tech Second Year (Mechanical Engineering)
Semester: III & IV

Liberal Learning
Course Code: 231MECCAC201
Course Code: 231MECCAC202

Course Plan

Course Title : 3D'iots: 3D Printing Student Club	
Course Code : Course Code: 231MECCAC201 and 231MECCAC201	**Semester : III & IV**
Teaching Scheme : L-T-P :	Credits : Audit
Evaluation Scheme :	Marks : **Grade**

Overview:

3Diot is a dynamic student-run club within the mechanical engineering department, dedicated to exploring and advancing the field of 3D printing. The club provides a platform for students to learn, innovate, and compete in the realm of additive manufacturing. Through a series of structured activities including bootcamps, awareness sessions, and competitions, 3D'iots aims to cultivate a deep understanding and practical expertise in 3D printing technologies among its members.

Aims:

1. To foster interest and enthusiasm for 3D printing among students.
2. To provide hands-on experience with 3D printing technologies.
3. To promote innovation and creativity in the design and manufacturing processes.
4. To bridge the gap between theoretical knowledge and practical application in 3D printing.
5. To build a community of like-minded individuals passionate about 3D printing.

Objectives:

1. Conduct regular 3D printing boot-camps to train students in the basics and advanced techniques of 3D printing.
2. Facilitate mentorship programs where experienced members can guide beginners in their learning journey
3. Encourage students to undertake innovative projects and research work in the field of 3D printing.

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4. Organize hackathons and challenges to stimulate problem-solving and creative thinking.
5. Create partnerships with industry professionals and academic experts to enhance learning opportunities.
6. Offer rewards and recognition for outstanding achievements in various 3D printing challenges.

Outcomes:

1. Members will gain a comprehensive understanding of 3D printing technologies and their applications.
2. Students will develop practical skills in designing, prototyping, and manufacturing using 3D printers.
3. Members will be better prepared for careers in engineering and manufacturing, with a strong portfolio of 3D printing projects.
4. Networking opportunities with industry professionals will enhance career prospects.
5. A strong, supportive community of 3D printing enthusiasts will be established, fostering collaboration and continuous learning.

Evaluation Guidelines

- **Attendance:** Regular attendance in bootcamps, workshops, and club meetings.
- **Engagement:** Active participation in discussions, Q&A sessions, and group activities.
- **Teamwork:** Collaboration with peers on projects and challenges.
- **Technical Proficiency:** Ability to operate 3D printers, use relevant software (e.g., CAD, slicing tools), and troubleshoot common issues.
- **Project Execution:** Successful completion of assigned projects and tasks within the given timeframe.
- **Innovation:** Demonstration of creativity and innovative thinking in project design and implementation.
- **Event Participation:** Involvement in organizing and participating in competitions, workshops, and awareness campaigns.
- **Community Building:** Contribution to building a supportive and collaborative club environment.
- **Competition Performance:** Participation and performance in internal and external 3D printing competitions.
- **Project Showcase:** Presentation of completed projects during club meetings or events.
- **Awards and Accolades:** Recognition received for outstanding work and contributions.

Certification Levels

1. Beginner Level Certification:

- Attend at least 75% of the bootcamps and workshops.

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- Complete a basic 3D printing project (e.g., designing and printing a simple object).
- Demonstrate understanding of basic 3D printing concepts and machine operation.

2. Intermediate Level Certification:

- Successfully complete multiple 3D printing projects, including a complex design.
- Participate in at least one internal competition or challenge.
- Show proficiency in troubleshooting and maintaining 3D printers.

3. Advanced Level Certification:

- Lead a team in a major 3D printing project or competition.
- Organize or contribute significantly to a club event or workshop.
- Conduct a presentation or seminar on a specialized 3D printing topic.
- Publish a Research Article in Journal or Conference

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B. Tech Second Year (Mechanical Engineering)
Semester: III & IV

Liberal Learning
Course Code: 231MECCAC201
Course Code: 231MECCAC202

Course Plan

Course Title : Waste to Best Student Club	
Course Code : Course Code: 231MECCAC201 and 231MECCAC201	**Semester : III & IV**
Teaching Scheme : L-T-P :	Credits : Audit
Evaluation Scheme :	Marks : **Grade**

Overview:

The "Waste to Best" student club aims to promote environmental sustainability through creative recycling and waste management initiatives within the community. Waste to Best club play an important role in creating environmental awareness amongst the future generation. It is the means by which students can be empowered to participate and take up meaningful environmental activities and projects.

Many activities, projects, competitions are arranged to make a frame work of Waste to best club. Preparation of Eco-friendly product out of waste material forms an important part of this club, as it enables us to make the useless things more useful.

Aims:

1. To educate students and the community about the importance of waste reduction, recycling, and upcycling to minimize environmental impact.
2. To encourage the adoption of sustainable behaviors among students.
3. To Providing opportunities for students to take leadership roles in environmental stewardship through practical initiatives and projects.
4. Inspiring creativity by exploring innovative ways to repurpose waste materials into useful or artistic items.

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Objectives:

1. To Organise regular drives to collect recyclable materials like paper, plastic, and electronics from students and faculty.
2. To host workshops and different activities where members learn to transform waste materials into useful items such as crafts, artwork.
3. Initiating campaigns to educate people about the importance of waste reduction, recycling, and upcycling in preserving the environment.
4. Partnering with local businesses or environmental organizations for resources, guest speakers, or field trips related to waste management and sustainability.
5. To encourage students to undertake innovative projects and research work in the field of environmental sustainability through creative recycling and waste management.
6. To provide hands-on learning experiences in recycling and upcycling, fostering creativity and environmental stewardship among students.
7. To organize competitions for produce useful products from waste materials through their creative thinking.

Outcomes:

- **Environmental:** Reducing the carbon footprint by diverting waste from landfills and promoting sustainable practices.

- **Educational:** Providing hands-on learning experiences in recycling and upcycling, fostering creativity and environmental stewardship among students.

- **Community:** Building a sense of community and responsibility towards the environment among club members and the broader college population.

Evaluation Guidelines

- **Attendance:** Regular attendance in activities, workshops, and club meetings.
- **Engagement:** Active participation in discussions, Q&A sessions, and group activities.
- **Teamwork:** Collaboration with peers on projects and challenges.
- **Project Execution:** Successful completion of assigned projects and tasks within the given timeframe.
- **Innovation:** Demonstration of creativity and innovative thinking in project design and implementation.
- **Event Participation:** Involvement in organizing and participating in competitions, workshops, and awareness campaigns.
- **Community Building:** Contribution to building a supportive and collaborative club environment.
- **Competition Performance:** Participation and performance in internal and external Waste to best competitions.

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- **Project Showcase:** Presentation of completed projects during club meetings or events.
- **Awards and Accolades:** Recognition received for outstanding work and contributions.

Certification Levels

1. Beginner Level Certification:

- Regular organization of recycling drives within the college community.
- Completion of at least two upcycling workshops or projects.
- Participation in local environmental awareness campaigns or events.

2. Intermediate Level Certification:

- Expansion of recycling initiatives to include more types of materials (e.g., electronics, organic waste).
- Implementation of a sustainable practice campaign (e.g., promoting reusable water bottles or reducing paper waste).
- Collaboration with at least one external organization or business on a sustainability project.

3. Advanced Level Certification:

- Development and implementation of a comprehensive waste audit and reduction plan for the school, colleges and industries.
- Creation of an ongoing sustainability education program involving multiple college grades or departments.
- Establishment of long-term partnerships with multiple external stakeholders (e.g., local government, NGOs, businesses).

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B. Tech Second Year (Mechanical Engineering)
Semester: III & IV

Liberal Learning
Course Code: 231MECCAC201
Course Code: 231MECCAC202

Course Plan

Course Title : Lean Club	
Course Code : Course Code: 231MECCAC201 and 231MECCAC201	**Semester : III & IV**
Teaching Scheme : L-T-P :	Credits : Audit
Evaluation Scheme :	Marks : **Grade**

Overview:

Lean Manufacturing Clubs (LMCs) serve as platforms for students to cultivate proficiency in lean manufacturing principles. lean manufacturing prioritizes waste minimization and process optimization for enhanced efficiency. LMCs offer a multifaceted learning experience. Workshops, guest lectures by industry professionals, and interactive discussions equip students with core lean concepts such as value stream mapping and the 5S methodology. By engaging with these principles, students bridge the theory-practice gap, gaining practical insights applicable to real-world manufacturing scenarios. LMCs play a vital role in equipping students with theoretical knowledge and practical application of lean manufacturing principles. This exposure prepares them for future careers in manufacturing, engineering, and supply chain management.

Aims:

1. To equip students with a foundational understanding of lean manufacturing principles and methodologies (e.g., value stream mapping, Kanban, 5S).
2. To bridge the gap between theoretical classroom learning and practical application in manufacturing environments.
3. To develop problem-solving skills by applying lean principles to real-world manufacturing scenarios through case studies and simulations.
4. To foster critical thinking and analytical abilities to identify and eliminate waste within production processes.

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Objectives:

1. Knowledge Acquisition: Equip students with a foundational understanding of lean manufacturing principles and methodologies (e.g., value stream mapping, Kanban, 5S).
2. Skill Development: Foster critical thinking, problem-solving, and analytical abilities to identify and eliminate waste within production processes.
3. Practical Application: Bridge the gap between theoretical classroom learning and practical application in manufacturing environments through case studies and simulations.
4. Networking: Create a community for engineering students interested in manufacturing and operations.
5. Industry Exposure: Facilitate interaction with industry professionals through guest lectures, plant visits, or mentorship programs.
6. Career Development: Enhance student resumes by showcasing their involvement with the LMSC and their acquired lean manufacturing knowledge.
7. Job Market Readiness: Increase students' competitiveness in the job market, particularly in manufacturing, engineering, and supply chain fields.
8. Process Improvement Mindset: Cultivate a process-oriented mindset that prioritizes efficiency and continuous improvement.

Outcomes:

1. **Strong Foundation in Lean Manufacturing:** LMSC participation equips students with in-demand knowledge of lean principles and methodologies, making them proficient in a core industry skill.
2. **Enhanced Problem-Solving and Critical Thinking:** Through applying lean concepts to real-world scenarios with case studies and simulations, students develop strong problem-solving and analytical abilities.
3. **Improved Job Market Readiness and Career Prospects:** Understanding lean manufacturing principles gives students a significant advantage in manufacturing, engineering, and supply chain careers, making them more competitive and opening doors to potential job opportunities through industry connections fostered by the club.

Evaluation Guidelines

- **Attendance:** Regular attendance in activities, workshops, and club meetings.
- **Engagement:** Active participation in discussions, Q&A sessions, and group activities.
- **Teamwork:** Collaboration with peers on projects and challenges.
- **Event Participation:** Involvement in organizing and participating in competitions, workshops, and awareness campaigns.
- **Community Building:** Contribution to building a supportive and collaborative club environment.
- **Competition Performance:** Participation and performance in internal and external Waste to best competitions.

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Certification Levels

1. Beginner Level Certification: (Lean Manufacturing Fundamentals)

- Target Audience: New members or students with minimal lean manufacturing knowledge.
- Focus: Develop a foundational understanding of core lean concepts like value stream mapping, 5S, Kanban, and Kaizen through workshops, guest lectures, and introductory activities.
- Activities: Attend introductory workshops, participate in basic simulations or case studies applying lean principles to simple scenarios

2. Intermediate Level Certification: (Lean Manufacturing Applications with Six Sigma Yellow Belt Certification)

- Target Audience: Students with a basic understanding of lean principles who want to deepen their knowledge and explore Six Sigma methodology.
- Focus: Build upon foundational lean concepts and explore the introduction of Six Sigma Yellow Belt principles for problem-solving within manufacturing environments.
- Attend workshops or training sessions on the DMAIC methodology (Define, Measure, Analyze, Improve, Control) used in Six Sigma.
- Analyze case studies that integrate lean and Six Sigma principles for process improvement.
- Participate in group projects or simulations focused on applying both lean and Six Sigma Yellow Belt tools to identify and eliminate waste in a manufacturing scenario.

3. Advanced Level Certification: (Lean Manufacturing Leadership and Industry Engagement with Six Sigma Green Belt Certification)

- Target Audience: Advanced members with a strong understanding of lean principles seeking leadership experience, industry exposure, and potential exploration of Six Sigma Green Belt certification.
- Focus: Develop leadership skills, engage with industry professionals, mentor new members, and delve deeper into Six Sigma methodology. Students can explore pursuing a Six Sigma Green Belt certification to further enhance their skillset.
- Attend workshops or training courses on Six Sigma Green Belt methodology, focusing on a deeper understanding of DMAIC (Define, Measure, Analyze, Improve, Control) and its application in conjunction with lean principles.
- Participate in case studies that integrate advanced lean and Six Sigma Green Belt tools for complex process improvement scenarios.

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B. Tech Second Year (Mechanical Engineering)
Semester: III & IV

Liberal Learning
Course Code: 231MECCAC201
Course Code: 231MECCAC202

Course Plan

Course Title : जिज्ञासा: Curious for Robots (Robotics and Automation Student Club)	
Course Code : Course Code: 231MECCAC201 and 231MECCAC201	**Semester : III & IV**
Teaching Scheme : L-T-P :	Credits : Audit
Evaluation Scheme :	Marks : **Grade**

Overview: The Robotics and Automation Club to explore the field of Robotics from its basics. Robotics and Automation is ever blooming and upcoming field with tremendous scope and opportunities for Mechanical Engineers. The club aims to open horizon of knowledge and opportunities in the field of Robotics and Automation through various events, competitions and workshops.

- **Aims:**
  - To foster interest and enthusiasm for Robotics and Automation among students.
  - To provide hands-on experience with Robotics Development and Automation Systems..
  - To promote innovation and creativity in the design and manufacturing processes.
  - To bridge the gap between theoretical knowledge and practical application in Robotics and Automation
  - To build a community of like-minded individuals passionate about Robotics and Automation.
- **Objectives: -**
  1. To facilitate students to learn Automation and Robotics
  2. To provide students a platform to design robots and provide smart solutions in automation
  3. To enable students to learn programming for robots and automation systems
- **Outcomes: -**

  Through the club students will be able to
  1. Understand basic robot anatomy, design principles of robots and automation systems
  2. Design and develop robots for different applications
  3. Provide solutions for automation related problems to society and industry

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Evaluation Guidelines

- **Attendance:** Regular attendance in bootcamps, workshops, and club meetings.
- **Engagement:** Active participation in discussions, Q&A sessions, and group activities.
- **Teamwork:** Collaboration with peers on projects and challenges.
- **Technical Proficiency:** Ability to build Arduino circuits, use relevant software (e.g., Arduino IDE etc.), and troubleshoot common issues.
- **Project Execution:** Successful completion of assigned projects and tasks within the given timeframe.
- **Innovation:** Demonstration of creativity and innovative thinking in project design and implementation.
- **Event Participation:** Involvement in organizing and participating in competitions, workshops, and awareness campaigns.
- **Community Building:** Contribution to building a supportive and collaborative club environment.
- **Competition Performance:** Participation and performance in internal and external Robotics competitions such as RoboRace, RoboWar, RoboMaze, RoboSoccer etc..
- **Project Showcase:** Presentation of completed projects during club meetings or events.
- **Awards and Accolades:** Recognition received for outstanding work and contributions

Certification Levels

1. Beginner Level Certification (Level 1):

- Attend at least 75% of the bootcamps and workshops.
- Develop a wire Controlled robot with basic components.
- Demonstrate understanding of basic robotics concepts and types of robots.

2. Intermediate Level Certification (Level 2):

- Successfully develop robot with wireless remote control.
- Participate in at least one internal competition or challenge.
- Show proficiency in developing innovative ideas for robots development.

3. Advanced Level Certification (Level 3):

- Lead a team in a reputed Robotics project or competition.
- Organize or contribute significantly to a club event or workshop.
- Conduct a presentation or seminar specialized in Robotics or IoT domain.
- Publish a Research Article in Journal or Conference.

Program Coordinator **Dean Academics** **HoD**

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