Syllabus of 3rd Sem
Mechanical Engineering

PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING, NAGPUR
DEPARTMENT OF MECHANICAL ENGINEERING
Scheme of Examination for B.Tech. in Mechanical Engineering

III Semester

Sr. No.	Course Code	Category	BOS/ Dept	Course Name	Hours/ Week			Credits	Maximum Marks			Min. Passing Marks			ESE Duration (Hrs.)
					L	T	P		Continuous Evaluation	End Semester Exam	Total	Continuous Evaluation	End Sem Exam	Total	
1	ME301T	PC-PCC	ME	Kinematics of Machines	2			2	20	30	50	---	8	23	02
2	ME302T	PC-PCC	ME	Material Science & Engineering	2			2	20	30	50	---	8	23	02
3	ME302P	PC-PCC	ME	Lab - Material Testing			2	1	25	25	50	---	---	25	--
4	ME303T	MDM	ME	MDM 01: Basic of Mechanical Engineering	2			2	20	30	50	---	8	23	02
5	ME304T	MC-OE	ME	Open Elective-01	3			3	40	60	100	---	15	45	03
6	ME304P	MC-OE	ME	Lab - Open Elective-01			2	1	25	25	50	---	---	25	--
7	HUM305T	HSSM-EMC	ASH	Engineering Economics	2			2	20	30	50	---	8	23	02
8	HUM306T	HSSM-VEC	ASH	Environmental Science	2			2	20	30	50	---	8	23	02
9	ME307T	PC-PCC	ME	Strength of Material	2			2	20	30	50	---	8	23	02
10	ME308P	PC-PCC	ME	Lab - M/C Drawing & Solid Modeling			2	1	25	25	50	---	---	25	---
11	ME309P	ELC-CEP/FP	ME	Comm. Engg. Project (CEP)/Field Project (FP)			4	2	50	50	100	---	---	50	---
Total					**15**		**10**	**20**	**285**	**315**	**650**				**15**

Open Elective-01

Precision Engineering	Mechatronics	Engineering Material
ME304AT	ME304BT	ME304CT

Theory	Practical
07	04

Head
Mechanical Engineering Department
Priyadarshini Bhagwati College of Engineering, Nagpur

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DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS OF SECOND YEAR BACHELOR OF TECHNOLOGY

SEMESTER III

COURSE AS PER NEP

COURSE TITLE : KINEMATICS OF MACHINE

COURSE CODE: ME301T

Hours/ Week	Credits	Duration of End Sem. Exam	Continuous Evaluation	End Sem. Exam	Total Marks
TH- 2Hrs.	2	2 Hrs.	20	30	50

Course Objectives:

1.	Make student conversant with the process of motion transformation.
2.	Student should develop ability to critically analyze the machines,
3.	Student should criticize mechanisms and controlling devices, and contrive new mechanisms.

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

CO1	Analyze various types of linkage mechanisms for obtaining specific motion.
CO2	Perform kinematic analysis (Displacement, Velocity, acceleration) of a given mechanism using graphical method.
CO3	Construct cam profiles and analysis the follower motion.

SYLLABUS

UNIT I : MECHANISMS	**(8 HOURS) (10 MARKS)**
Basic concept of mechanism, link, kinematics pairs, kinematics chain, mechanism, Difference between machine and mechanism, Inversions, Degrees of freedom, Various types of mechanism such as Geneva wheel, Pawl and ratchet mechanism, Exact straight-line mechanism.	
UNIT II: KINEMATIC ANALYSIS OF SIMPLE MECHANISMS	**(8 HOURS) (10 MARKS)**
Displacement, velocity, and acceleration analysis; Velocity analysis using instantaneous enters, of Rotation method, Kennedy's theorem, Concept of Corioli's component of acceleration. (Can use excel spread sheets)	
UNIT II: CAMS AND FOLLOWERS	**(8 HOURS) (10 MARKS)**
Classification and terminology; Displacement, velocity, acceleration diagrams; Uniform velocity, parabolic, simple harmonic, and cycloidal motions; Graphical disc cam profile synthesis for roller and flat face followers	

Textbooks:

1. Thomas Bevan, "Theory of Machines," CBS Publishers & Distributors, 2005.
2. W. L. Cleghorn, "Mechanisms of Machines," Oxford University Press, 2005.
3. R. L. Norton, "Kinematics and Dynamics of Machinery," Tata McGraw Hill, 2009.
4. A. Ghosh and A.K. Mallick, "Theory of Mechanisms and Machines," Affiliated East-West Pvt. Ltd, New Delhi, 1988

Reference Book:

1. Theory of Machines and Mechanisms, J. E. Shigley and J. J. Uicker, Oxford University Press.
2. Theory of Machines, Sadhu Singh, Pearson publications.
3. Advanced Mechanism Design– Analysis and Synthesis, A.G.Erdman and G.N.Sandor, Vol. I and II,Prentice – Hall.
4. "Mechanisms and Mechanical Devices Source Book", Neil Sclater, Nicholas P Chrironis, McGraw-Hill.
5. Kinematics and Linkage Design, A. S. Hall, Jr., Prentice – Hall.
6. Mechanism Synthesis and Analysis, A. H. Soni, McGraw Hil.

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SEMESTER III

COURSE AS PER NEP

COURSE:- MATERIAL SCIENCE & ENGINEERING
COURSECODE: ME302T

Hours/Week	Credits	Duration of End Sem Exam	Continuous Evaluation	End Sem. Exam	Total Marks
TH-2Hrs.	2	2Hrs.	20	30	50

Course Objectives:

1.	To impart fundamental knowledge of engineering materials, their classification, properties, and phase diagrams.
2.	To develop an understanding of heat treatment processes and the effect of alloying elements on the properties of steels.
3.	To familiarize students with cast irons, hardness testing methods, and the principles and applications of powder metallurgy.

Course Outcomes:

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

CO1	Explain the classification, properties, and applications of engineering materials and interpret phase diagrams.
CO2	Explain heat treatment processes and evaluate the effect of alloying elements on steel microstructure and performance.
CO3	Classify cast irons, perform hardness testing, and describe powder metallurgy processes and their applications.

SYLLABUS

UNIT I: ENGINEERING MATERIALS AND PHASE DIAGRAMS (8 HOURS) (10 MARKS)
Introduction to engineering materials their classification, properties & application. **Solid solution** & their types, Alloy & their formation, Hume Rothery Rule, grain shape & size, its effect on the properties. **Study of equilibrium diagrams** and invariant reactions. Iron-Iron carbide equilibrium diagram, critical temperatures. Microstructure of slowly cooled steels. Estimation of carbon from microstructures.
UNIT – II: HEAT TREATMENT AND ALLOY STEELS (8 HOURS) (10 MARKS)
Heat treatment, Annealing, Normalizing and Hardening. Hardenability test. TTT diagram and its construction, Various Surface hardening methods. **Steel:** Classification and application of plain carbon steels. Hadfield Manganese Steel, ball Bearing Steels, etc. Stainless Steels - Classification, composition, application and. Effect of alloying elements.
UNIT–III: CAST IRONS, HARDNESS TESTING AND POWDER METALLURGY (8 HOURS) (10 MARKS)
Cast Iron – Classification, White cast Iron, Gray Cast Iron, Nodular Cast Iron, Malleable Cast Iron, Effects of various parameters on structure and properties of Cast Iron. **Hardness Measurement:** Principles of hardness measurement, Hardness Test – Brinell, Rockwell, Vicker Non-destructive tests **Powder Metallurgy:** Powder manufacture and Conditioning, Production of Sintered Structural Components, Self-lubricating bearing, Cemented Carbides, Ceramics, Sintered Carbide cutting tools

Textbooks:

1. Material Science & Engineering, V. R. Raghavan,1974.
2. Material Science & Engineering, William Callister,1985.
3. Material Science & Engineering, R. K. Rajput,2009.
4. Material Science & Engineering, An Introduction, 6th Edition, Donald Askeland, 1984

Reference Book:

1. Introduction to Physical Metallurgy 29st revised edition, 2009 Sidney H. Avner McGraw-Hill, 1964.
2. Engineering Physical Metallurgy and Heat Treatment 21st revised edition, 1988 Yu Lakhtin Mir publishers, Moscow, Russia.
3. Introduction to Engineering Metallurgy 21st revised edition, 2007 Dr. B K Agrawal Tata Mc-Gra-Hill.
4. Metallurgy for Engineers 4th Revised edition 1987 E C Rollason E. Arnold.

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DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS OF SECOND YEAR BACHELOR OF TECHNOLOGY,

SEMESTER III

COURSE AS PER NEP

COURSE:- MATERIAL TESTING LAB
COURSECODE: ME302P

Hours/Week	Credits	Duration of End Sem Exam	Continuous Evaluation	End Sem. Exam	Total Marks
TH- 2Hrs.	1	--	25	25	50

Course Objectives:

1.	To familiarize students with the use of metallurgical microscopes and techniques for specimen preparation and microstructural analysis of metals.
2.	To enable students to perform various mechanical tests such as tensile, compression, impact, and hardness tests to evaluate material behavior.
3.	To provide hands-on experience in operating material testing equipment and interpreting test results to understand mechanical properties.

Course Outcomes:

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

CO1	Prepare specimens and examine the microstructure of ferrous materials using a metallurgical microscope.
CO2	Conduct and analyze standard mechanical tests (tensile, compression, impact) to determine material strength and behavior.
CO3	Perform hardness tests using Rockwell and Brinell methods and interpret the results to assess material hardness.

Course Content:

List of practical

Note: Any 08 experiments should be included in the Journal

1. To study Metallurgical Microscopes & Preparation of specimen for metallographic examination.
2. Micro-structural examination of different types of Steels
3. Micro-structural study of White Cast Iron and Grey Cast Iron
4. Study of Universal Testing Machine
5. Determination of tensile properties of ductile material
6. Determination of properties of brittle material
7. Compression test on materials
8. Impact test on materials
9. Measurement of hardness with the help of Rockwell Hardness Tester
10. Measurement of hardness with the help of Brinell Hardness Tester

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DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS OF SECOND YEAR BACHELOR OF TECHNOLOGY,

SEMESTER III

MULTIDISCIPLINARY MINOR COURSE AS PER NEP

COURSE:- BASIC OF MECHANICAL ENGINEERING
COURSE CODE: ME303T

Hours/ Week	Credits	Duration of End Sem. Exam	Continuous Evaluation	End Sem. Exam	Total Marks
TH- 2Hrs.	2	2 Hrs.	20	30	50

Course Objectives:

1.	To provide a foundational understanding of core mechanical engineering principles such as mechanisms, thermodynamics, heat transfer, and manufacturing processes.
2.	To enable students from diverse engineering backgrounds to apply mechanical concepts effectively in interdisciplinary and real-world problem-solving contexts.
3.	To familiarize students with industrial practices and processes relevant to mechanical engineering, promoting practical insight and engineering decision-making in multidisciplinary environments.

Course Outcomes:

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

CO1	Understand the fundamental concepts of mechanisms and power transmission in mechanical systems.
CO2	Explain the laws of thermodynamics, modes of heat transfer, basic refrigeration and air-conditioning systems, hydraulic machines, and internal combustion engines.
CO3	Identify and describe conventional manufacturing processes such as metal casting, forming, cutting, and joining techniques along with relevant tools and equipment.

SYLLABUS

UNIT I: INTRODUCTION OF MECHANICAL ENGINEERING (8 HOURS) (10 MARKS)
Introduction, significance, and applications of mechanical engineering in other engineering fields, concept of theory of machine, Concept of Mechanism and Machines, Introduction to various power transmission devices – Belt drives, Chain drive, Gear drive.
UNIT – II: THERMODYNAMICS (8 HOURS) (10 MARKS)
Thermodynamics: Scope of thermodynamics, thermodynamic systems and processes, Laws of Thermodynamics Concept of Heat Engine, Heat Pump & Refrigerator. Modes of heat transfer, conduction, convection & radiation with example. Hydraulic machines: Introduction to hydraulic turbines & hydraulic pumps. IC Engines: 2-stroke and 4-stroke engines.
UNIT – III: CONVENTIONAL MANUFACTURING PROCESSES (8 HOURS) (10 MARKS)
Conventional manufacturing processes, Metal Casting, Moulding and Patterns, Metal Forming: Extrusion, Forging, Rolling and Drawing, Sheet metal, Machining operations like Turning, Milling and Drilling, etc. Metal Joining Processes: Gas Welding, Arc Welding, Soldering and Brazing.

Textbooks:

1. Workshop Technology (Volume I), Hajra Chaudhary, Media Promoters &Publishers.
2. Theory of Machine, S. S. Rattan, Tata McGraw Hill.
3. Thermal Engineering- Mahesh M. Rathore, McGraw Hill Education
4. A Textbook of Fluid Mechanics and Hydraulic Machines- R. K. Bansal, Laxmi Publications
5. Basic Mechanical Engineering – M.P. Poonia & S.C. Sharma, Khanna Publishing House, Delhi
6. Elements of Mechanical Engineering – M. L. Mathur, F. S. Mehta and R. P. Tiwari, Jain Brothers, New Delhi

Reference Book:

1. Mechanical Workshop Practice by K. C. John (PHI Learning Private Limited).
2. Nag PK, Tripathi et al; Basic Mechanical Engineering; Tata McGraw Hill.
3. Engineering Thermodynamics - R.K.Rajput , Laxmi Publication Ltd.

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DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS OF SECOND YEAR BACHELOR OF TECHANOLOGY

SEMESTER III

COURSE AS PER NEP

COURSE: - OPEN ELECTIVE-I: PRECISION ENGINEERING

COURSE CODE: ME304AT

Hours / Week	Credits	Duration of End Semester Exam	Continuous Evaluation	End Sem. Exam	Total Marks
TH- 3 Hrs.	3	3 Hrs.	40	60	100

COURSE OBJECTIVES:

1.	To introduce the science of measurement and standards used in engineering.
2.	To provide knowledge about various measuring instruments and their applications.
3.	To familiarize students with the principles of limits, fits, and gauge design.
4.	To develop an understanding of quality inspection using comparators and optical tools.

COURSE OUTCOMES:

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

CO1	Understand the importance of standards and tolerances in engineering design.
CO2	Classify and apply different types of fits in mechanical assemblies.
CO3	Design simple limit gauges using Taylor's principle.
CO4	Perform basic linear and angular measurements using standard instruments.
CO5	Use comparators and optical devices for precision measurements.

SYLLABUS

Unit I : **(7 Hours - 12 Marks)**
Fundamentals of Standards and Tolerances: Standards of measurement: Line standards, End standards, and Wavelength standards, Definitions and concepts: Allowance, Tolerance, Fit, Interchangeability and its importance in mass production, Selective Assembly – Applications and relevance in manufacturing.
Unit – II: **(7 Hours - 12 Marks)**
Limits, Fits, and System of Fits : Definition and significance of Limits, Types of Fits: Clearance, Transition, and Interference, Hole basis and Shaft basis systems – Concept, application, and comparison, Application of fit systems in engineering components.
Unit – III: **(7 Hours - 12 Marks)**
Limit Gauge Design and Process Planning: Design principles of Limit Gauges – Taylor's Principle, Types of gauges: Go/No - Go Gauges, Analytical design and calculation of plug and snap gauges, Introduction to Process Planning Sheet – Purpose, elements, and examples.
Unit – IV: **(7 Hours - 12 Marks)**
Linear and Angular Measurement Techniques: Measurement of straightness and flatness – importance and methods, Linear Measuring Instruments: Vernier caliper, Micrometer, Dial Indicator, Angular Measuring Instruments: Sine bar, Angle gauge, Clinometer, Precision level, Taper gauge, Calibration and accuracy considerations.
Unit – V: **(8 Hours - 12 Marks)**
Comparators and Optical Instruments: Types of Comparators: Mechanical, Optical, Electrical, Electronic, Pneumatic – working principles and applications, Use of advanced optical measuring tools: Optical Profile Projector, Toolmaker's Microscope, Autocollimator, Comparison of comparator types based on sensitivity and application.

Text Books:

1. A Textbook of Engineering Metrology – I.C. Gupta, Dhanpat Rai.
2. Production Engg. - P.C. "Sharma, S. Chand.

Reference Book:

1. Engineering Metrology – R.K. Jain, Khanna Publishers

2. Modern Engineering Metrology – R.K. Rajput, S. Chand Publishing.

3. CMM and Dimensional Metrology – Jitendra M. Raut, Technical Publications Pune.

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DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS OF SECOND YEAR BACHELOR OF TECHANOLOGY

SEMESTER III

COURSE AS PER NEP

COURSE: OPEN ELECTIVE-I : PRECISION ENGINEERING LAB
COURSE CODE: ME304AP

Hours / Week	Credits	Duration of End Semester Exam	Continuous Evaluation	End Sem. Exam	Total Marks
PR- 2 Hrs.	1	--	25	25	50

COURSE OBJECTIVES:

The course aims to develop hands-on skills in using linear and angular measuring instruments, perform precision measurements for form features like flatness and straightness, and understand the working principles of comparators and optical measurement tools. It also enables students to carry out dimensional inspection of engineering components such as gears, design limit gauges for quality inspection based on standard fit systems, and prepare process planning documents while evaluating manufacturing capability using statistical tools.

COURSE OUTCOMES:

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

CO1	Demonstrate the use of linear measuring instruments such as vernier calipers, micrometres, and height gauges with proper handling and precision
CO2	Perform angular measurements using bevel protractor and sine bar, and interpret results accurately.
CO3	Measure flatness and straightness using surface plate and optical flats with appropriate procedures.
CO4	Calculate and design Go/No-Go limit gauges for a given tolerance specification using Taylor's principle.

COURSE CONTENT:

LIST OF PRACTICAL

Note: Any 08 experiments should be included in the Journal

1. Demonstration and practice using of Linear Measuring Instruments.
2. Angular Measurement Using Bevel Protractor.
3. Angular Measurement Using Sine Bar.
4. Use of Dial Indicators and Comparator Instruments.
5. Flatness and Straightness Measurement Using Surface Plate.
6. Gear Tooth Measurement Using Profile Projector.
7. Flatness measurement using optical flats.
8. Design calculation of a limit gauge.
9. Process planning sheet preparation for a sample component.

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DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS OF SECOND YEAR BACHELOR OF TECHANOLOGY

SEMESTER III

COURSE AS PER NEP

COURSE: - OPEN ELECTIVE-01: MECHATRONICS

COURSE CODE: ME304BT

Hours/ Week	Credits	Duration of End Sem. Exam	Continuous Evaluation	End Sem. Exam	Total Marks
TH- 3 Hrs.	3	2 Hrs.	40	60	100

Course Objectives:

To provide students with a foundational understanding of Mechatronic systems by integrating concepts of mechanical, electrical, electronics, and computer engineering, along with their practical applications in automation and intelligent systems.

Course Outcomes:

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

CO1	Describe the definition, scope, interdisciplinary nature, and real-world applications of Mechatronics in industrial systems.
CO2	Classify and explain the working principles of various sensors and transducers used in Mechatronic systems, and outline their role in signal conditioning and feedback mechanisms.
CO3	Analyze and select suitable actuators and motors (electric, pneumatic, and hydraulic) for specific industrial automation applications.
CO4	Explain the fundamentals of control systems, and demonstrate basic interfacing of sensors and actuators with microcontrollers or PLCs using simple ladder logic diagrams.
CO5	Evaluate the application of Mechatronic principles in modern systems including IoT, robotics, automation, and emerging trends like Industry 4.0.

SYLLABUS

UNIT I: INTRODUCTION TO MECHATRONICS	(7 HOURS)
❖ Definition and scope of Mechatronics ❖ Interdisciplinary nature: Integration of mechanical, electrical, electronics, and computer systems ❖ Applications in industry and automation ❖ Examples of Mechatronic systems (e.g., Washing machines, CNC machines, Robots)	
UNIT – II: SENSORS AND TRANSDUCERS	**(7 HOURS)**
❖ Definition and classification ❖ Working principle of basic sensors: Temperature, Pressure, Proximity, Light, and Speed sensors ❖ Signal conditioning basics ❖ Use of sensors in feedback systems	
UNIT – III: ACTUATORS AND DRIVES	**(7 HOURS)**
❖ Introduction to actuators: Electric, Hydraulic, and Pneumatic ❖ Types of electric motors: DC, Stepper, and Servo motors ❖ Selection of actuators for automation ❖ Real-life application examples	
UNIT – IV: CONTROL SYSTEMS AND INTERFACING	**(8 HOURS)**
❖ Basics of open-loop and closed-loop control ❖ Introduction to microcontrollers and PLCs (Programmable Logic Controllers) ❖ Basics of interfacing sensors and actuators ❖ Simple control logic using ladder diagrams (introductory level)	
UNIT – V: APPLICATIONS AND TRENDS IN MECHATRONICS	**(7 HOURS)**
❖ Mechatronics in robotics, smart appliances, automobiles, and medical devices ❖ Basics of IoT in mechatronics systems ❖ Introduction to automation and Industry 4.0 ❖ Future trends and career opportunities	

Textbooks:

1. Mechatronics: Principles and Applications by Godfrey C. Onwubolu, Elsevier (Academic Press)
2. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering by W. Bolton ,Pearson Education
3. Introduction to Mechatronics and Measurement Systems by David G. Alciatore and Michael B. Histand,McGraw-Hill Education

Reference books:

1. Mechatronics: Integrated Mechanical Electronic Systems by Clarence W. de Silva, CRC Press
2. Mechatronics System Design by Devdas Shetty and Richard A. Kolk, Cengage Learning
3. Mechatronics by R.K. Rajput,S. Chand & Company Ltd.
4. Mechatronics: Principles and Applications by M.D. Singh and J.G. Joshi, Prentice Hall India (PHI Learning).

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DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS OF FOURTH YEAR BACHELOR OF TECHNOLOGY,

SEMESTER III

COURSE AS PER NEP

COURSE: - OPEN ELECTIVE-01: MECHATRONICS LAB

COURSE CODE: ME304BP

Hours / Week	Credits	Duration of End Semester Exam	Continuous Evaluation	End Sem. Exam	Total Marks
PR- 2 Hrs.	1	--	25	25	50

Course Objectives:

To enable students to gain hands-on experience in the functioning, integration, and control of sensors, actuators, PLCs, and basic mechatronic systems through practical demonstrations, experiments, and industry-oriented applications.

Course Outcomes:

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

CO1	Students will be able to identify and describe the role and working of sensors, actuators, microcontrollers, and PLCs used in mechatronic systems.
CO2	Students will be able to demonstrate and analyze the operation of DC motor control systems and their integration with automation hardware.
CO3	Students will be able to develop and simulate ladder logic programs using PLC software for simple automation tasks.
CO4	Students will be able to analyze real-life mechatronic systems through case studies and industrial visits, and prepare a structured report on automation practices in industries.

COURSE CONTENT:

LIST OF PRACTICAL

Note: Any 08 experiments should be included in the Journal.

1. Study and demonstration of mechatronics system and its components.

2. Study and Demonstration of Sensors.

3. Study and Demonstration of Actuators.

4. To study of D.C.motor control unit

5. Study and Demonstration of PLC Hardware and Software.

6. To develop simple ladder logic programs for automation.

7. To study the working and control of a hydraulic system using a Programmable Logic Controller (PLC).

8. To study the working and control of a basic pneumatic system using manual and/or electronic control elements.

9. Mechatronics System Case Study (Group Activity)

10. Industrial Visit to any Automation Industrial and prepare Report.

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DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS OF SECOND YEAR BACHELOR OF TECHNOLOGY,

SEMESTER III

COURSE AS PER NEP

COURSE: - OPEN ELECTIVE-01: ENGINEERING MATERIAL

COURSECODE: ME304CT

Hours/Week	Credits	Duration of End Sem Exam	Continuous Evaluation	End Sem. Exam	Total Marks
TH- 3 Hrs.	3	2 Hrs.	40	60	100

Course Objectives:

To provide foundational knowledge of engineering materials, their properties, processing methods, testing techniques, and modern applications including smart and advanced materials.

Course Outcomes:

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

CO1	Understand the classification, properties, and selection criteria of engineering material.
CO2	Explain various heat treatment processes and evaluate the characteristics and applications of plain carbon and stainless steels.
CO3	Classify ferrous and non-ferrous alloys and analyze their composition, properties, and industrial applications.
CO4	Demonstrate knowledge of material testing methods including hardness measurement and non-destructive testing techniques.
CO5	Explore smart, advanced, electrical, and magnetic materials, and assess their properties and applications in modern engineering systems.

SYLLABUS

UNIT I: INTRODUCTION TO ENGINEERING MATERIALS (7 HOURS)
Introduction to engineering materials: Metals, plastics, ceramics and composites, properties of engineering materials (physical, mechanical, thermal, electrical, chemical), Range of applications; Material designation and standards; Ashby diagrams; Selection criteria and process. Different phases and various invariant reactions in Iron-Iron carbide equilibrium diagram, critical temperatures.
UNIT – II : HEAT TREATMENT AND STEELS (7 HOURS)
Heat treatment and its importance. Annealing, Normalizing, Hardening, TTT diagram. **Plain Carbon Steels:** Classification and application of plain carbon steels. Stainless Steels - Classification, composition, application.
UNIT–III: FERROUS AND NON-FERROUS ALLOYS (7 HOURS)
Ferrous – Classification Cast Iron and its Application. **Non-Ferrous Alloys** – Study of non-ferrous alloys such as brasses, Bronzes, Aluminum Alloys.
UNIT–IV: HARDNESS AND NON-DESTRUCTIVE TESTS (7 HOURS)
Hardness Measurement: Principles of hardness measurement, Hardness Test – Brinell, Rockwell, Vicker **Non-Destructive Tests** – Ultrasound Test, Die Penetration Test, radiography test
UNIT–IV: SMART AND ADVANCED MATERIALS (8 HOURS)
Smart Materials; Sensors and actuators; Piezoelectric, magnetostrictive and electrostrictive materials. **Advanced Materials** – Biomaterials, Optical materials, High temperature materials, Energy materials, and Nanomaterials. Electrical and Magnetic Materials: Types and application of Conducting, resisting materials, Semiconducting materials, Magnetic materials (Soft and hard magnetic materials), Superconductors and dielectric materials.

Textbooks:

1. W. D. Callister, "Materials Science & Engineering," Wiley India, 2014.
2. K. G. Budinski and M.K. Budinski, "Engineering Materials", PHI India, 2002.
3. V. Raghavan, "Material Science and Engineering', PHI India, 2015.
4. U. C. Jindal, "Engineering Materials and Metallurgy", Pearson, 2011.

Reference Book:

1. Introduction to Physical Metallurgy 29st revised edition, 2009 Sidney H. Avner McGraw-Hill, 1964.
2. Engineering Physical Metallurgy and Heat Treatment 21st revised edition, 1988 Yu Lakhtin Mir publishers, Moscow, Russia.
3. Introduction to Engineering Metallurgy 21st revised edition, 2007 Dr. B K Agrawal Tata Mc-Gra-Hill.
4. Metallurgy for Engineers 4th Revised edition 1987 E C Rollason E. Arnold.

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DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS OF SECOND YEAR BACHELOR OF TECHNOLOGY,

SEMESTER III

COURSE AS PER NEP

COURSE:- ENGINEERING MATERIAL LAB
COURSECODE: COURSECODE: ME304CP

Hours/Week	Credits	Duration of End Sem Exam	Continuous Evaluation	End Sem. Exam	Total Marks
TH- 2Hrs.	1	--	25	25	50

Course Objectives:

1.	Provide hands-on training in microstructural analysis, specimen preparation, and heat treatment of engineering materials.
2.	Develop skills in hardness testing and other material evaluation techniques.
3.	Enable understanding of the relationship between material structure, processing methods, and resulting properties.

Course Outcomes:

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

CO1	Demonstrate metallurgical microscope and prepare specimens for microstructural examination.
CO2	Identify and interpret microstructures of steels, cast irons, and non-ferrous metals.
CO3	Analyze the effects of heat treatment processes such as annealing and normalizing on material properties.
CO4	Perform and compare hardness tests using Brinell and Rockwell hardness testers.

Course Content:

List of practical

Note: Any 08 experiments should be included in the Journal

1. Study of Metallurgical Microscope.
2. Preparation of Specimen for metallographic examinations.
3. Study and drawing of microstructures of Steels.

4. Study and drawing of microstructures of Cast Iron.
5. Study and drawing of microstructures of Non Ferrous Metals.
6. Study of the effect of annealing and normalizing on properties of steels.
7. Determination of hardenability of steels by Jominy End Quench test.
8. Measurement of hardness with the help of Brinell hardness tester.
9. Measurement of hardness with the help of Rockwell hardness tester.
10. Study of heat treatment process.

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SEMESTER III

COURSE AS PER NEP

COURSE TITLE: ENGINEERING ECONOMICS

COURSE CODE: HUM305T

Hours/ Week	Credits	Duration of End Sem. Exam	Continuous Evaluation	End Sem. Exam	Total Marks
TH- 2Hrs.	2	2 Hrs.	20	30	50

Course Objectives:

1.	This Course is designed to gain basic knowledge in Economics and understand the concept of macro and micro level Economics with important economic terminologies and key concepts of Engineering Economics and to create awareness about Market structure, Business cycle and Taxation system

Course Outcomes:

On completion of this course, learner will be able to

CO1:	Understand the concept of Demand and Supply and distinguish between Micro and Macro Economics its relationship with the Price.
CO2:	Relate various Factors of Production with reference to different Economic Sectors, Business cycle and Understand the Market Structure.
CO3:	Analyze the Various Concepts of Cost, Causes and Effects of Inflation, Recession and Taxations system.

UNIT I: Basic Concepts of Economics	(8 Hours) (10 Marks)
Definition & Scope of Economics, Difference between Micro and Macroeconomics, Concept of Top and Bottom line of the Organization (Growth), Economic analysis of business, Economics of Operations, Law of Demand, Types of Demand, Law of Supply, Concept and Types of Elasticity of Demand.	
UNIT II: Theory of Production and Market Structure	**(8 Hours) (10 Marks)**
Factors of Production, Firm and Industry, Market and Market Structures, Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly, Pricing strategies in various markets, Various Phases of Business Cycle, Economies of scale.	
UNIT III: Theory of Cost , Inflation and Taxation	**(8 Hours) (10 Marks)**
Various Concepts of Cost, Fixed, Variable, Average, Marginal and Total Cost, Inflation , Effect of Inflation, Deflation, Recession, Monetary and Fiscal Measures to Control Inflation, Direct and Indirect Taxes	

List of Books:

Text Books:

1. Modern Economic Theory – K.K. Dewett, S.Chand Publishers
2. Modern Economics – H. L. Ahuja , S.Chand Publishers
3. Engineering Economics - D.N. Dwivedi, A. Dwivedi ,Vikas Publishing House
4. Industrial Economics. By, Ranjana Seth, Ane Book Pvt Ltd.
5. Industrial Economics. By, Jagdish Sheth, Pearson Publication.

Reference Books:

1. Business Economics. By, K.Rajgopalchar. Atalantic Publishers.
2. Microeconomics. By, Robert Pindyk
3. Business Economics.By, H.L. Ahuja,H. L. Ahuja,Louis Prof. De Broglie. S.Chand.

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SEMESTER III

COURSE AS PER NEP

COURSE :-ENVIRONMENTAL SCIENCE

COURSE CODE:- HUM306T

Hours/ Week	Credits	Duration of End Sem. Exam	Continuous Evaluation	End Sem. Exam	Total Marks
TH- 2Hrs.	2	2 Hrs.	20	30	50

Course Objectives:

1.	To introduce various natural resources available.
2.	To attain the knowledge about ecosystem and biodiversity.
3.	To understand and evaluate the global scale of environmental problems.

Course Outcomes:

On completion of this course, learner will be able to

CO1:	Utilize the knowledge on natural resources and understand the ecosystem thoroughly.
CO2:	Explain the bio-diversity and its conversion.
CO3:	Identify and analyze the consequences of pollution, application of knowledge for sustainability

UNIT I: INTRODUCTION TO NATURAL RESOURCES & ECOSYSTEMS **(8 HOURS)(10 MARKS)**

Renewable and Non-Renewable resources: Natural resources and associated problems.

a. **Forest resources:** Use and over-exploitation, deforestation, case studies. Timber extraction mining, dams and their effects on forest and tribal problems.
b. **Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological, succession. Food chains, food webs and ecological pyramids.

a. Introduction, types, characteristic features, structure and function of the following ecosystem: - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries.

UNIT II: BIODIVERSITY AND ITS CONSERVATION **(8 HOURS) (10 MARKS)**

Introduction - Definition: genetic, species and ecosystem diversity. Biogeographical classification of India, Value of biodiversity:

consumptive use, productive use, social, ethical, aesthetic and option values Biodiversity at global, National and local levels. India as a mega diversity nation Hot-sports of biodiversity.

Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and

Ex-situ conservation of biodiversity.

UNIT III: ENVIRONMENTAL POLLUTION & CONTROL **(8 HOURS) (10 MARKS)**

- Definition, Cause, effects and control measures of: -

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act.
- Sustainable Development

List of Books:

Text Books:

1. Benny Joseph, "Environmental Studies", 3rd Edition, McGraw Hill Education Publication, 2017.
2. D. D. Mishra, and S.S. Dara, "A Textbook of Environmental Chemistry and Pollution Contol", 7th Edition, S. Chand & Company Ltd., 2004.
3. Textbook of Environmental Studies, Erach Bharucha, Universities Press.
4. A Textbook of Environmental Studies, D.K. Asthana and Meera Asthana, 1st edition, S. Chand.
5. A Textbook of Environmental Studies, Dr. Rajan Misra, Laxmi Publications Pvt. Ltd.

Reference Books:

1. P Aarne Vesilind, J. Jeffrey Peirce, and Ruth F. Weiner, "Environmental Pollution and Control" 4th Edition, Butterworth-Heinemann Publication, 1998.
2. Shibani Ghosh, "Indian Environmental Law: Key concepts and Principles", 1st Edition, Orient BlackSwan Publication.

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SEMESTER III

COURSE AS PER NEP

COURSE:- STRENGTH OF MATERIAL
COURSECODE: ME307T

Hours/Week	Credits	Duration of End Sem Exam	Continuous Evaluation	End Sem. Exam	Total Marks
TH-2Hrs.	2	2Hrs.	20	30	50

Course Objectives:

1.	To study different types of stresses, strain and deformation induced in the mechanical Components due to external loads.
2.	To design and analyze shaft for various loading conditions
3.	To understand design process and failure phenomena of Column & Struts

CourseOutcomes:

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

CO1	Explain the fundamental concepts of various types of loading and the resulting stresses induced in structural members.
CO2	Design of shafts subjected to various loading conditions based on strength and stiffness criteria
CO3	Estimate strain energy in mechanical elements and analyze deflection in beams using appropriate methods.

SYLLABUS

UNIT I: CONCEPT OF SIMPLE STRESSES AND STRAINS (8 HOURS) (10 MARKS)
Introduction, stress, strain, types of stresses, stress and strain diagram for brittle & ductile material, elastic limit, Hooks law, modulus of elasticity, modulus of rigidity, factor of safety. Longitudinal strain & stress, lateral stresses and strains, Poisson's ratio, volumetric stresses and strain with uni-axial, bi-axial & tri-axial loading, bulk modulus.
UNIT – II: TORSION OF CIRCULAR SHAFTS (8 HOURS) (10 MARKS)
Derivation of torsion equation with the assumptions made in it. Torsion shear stress induced in the shaft, when it is subjected to torque. Strength and rigidity criterion for design of shaft. Torque transmitted by solid & hollow circular shaft.
UNIT–III: COLUMN ,STRUTS & STRAIN ENERGY (8 HOURS) (10 MARKS)
Failure of long & short column, slenderness ratio, assumptions made in Euler's column theory, end conditions for column. Expression for crippling load for various end conditions of column and derivation on column with both ends hinged. Effective length of column, limitations of Euler's formula, Rankine formula. Definition of strain energy stored in a body when it is subjected to gradually applied load, suddenly applied loads & impact loads

Textbooks:

1. Strength of Materials by S. Ramamrutham and R. Narayanan, Dhanpat Rai Publishing Company (P) Ltd, 18th Edition 2017
2. Strength of Materials by R.K. Bansal, Laxhmi Publications , New Delhi, 6th edition, 2017

Reference Book:

1. Mechanics of Materials By Beer , Johnston, Dewolf and Mazurek , Tata McGraw- Hill Education , 7th edition , 2015.
2. Elements of Strength of Materials by Timoshenko, S.P. and Young, D.H., East West Press, 5th edition, 2011

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SEMESTER III

COURSE AS PER NEP

COURSE: - M/C DRAWING & SOLID MODELING
COURSECODE:ME308P

Hours/Week	Credits	Duration of End Sem Exam	Continuous Evaluation	End Sem. Exam	Total Marks
PR-2Hrs.	1	--	25	25	50

Course Objectives:

1.	This course is designed to develop fundamental concepts of machine drawing using special software's of Mechanical engineering

Course Outcomes:

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

CO1	Ability to draw and read production drawings. & ability to convert 3D object to its 2D representation
CO2	Ability to select standard machine elements as per the standards.
CO3	Ability to use the Drafting and Design package.
CO4	Ability to model machine components using geometric modeling software and able to construct detailed draft views of part or assembly

Course Content:

List of practical

Note: Any 08 Sheets should be included in the Portfolio

1. 2-D drawing of Mechanical parts.
2. 3-D drawing of Mechanical parts
3. Drafting of Mechanical Parts
4. Assembly of Mechanical Components

5. Simulation of Assemble mechanical parts
6. Complete drawing ,assembly ,and simulation of knuckle joint
7. Complete drawing, assembly, and simulation of power screw
8. Complete drawing, assembly, and simulation universal joint
9. Complete drawing, assembly, and simulation of any commercial real-life problem.

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SEMESTER III
COURSE AS PER NEP

COURSE: COMMUNITY ENGINEERING PROJECT / FIELD PROJECT
COURSE CODE: ME309P

Hours/ Week	Credits	Duration of End Sem Exam	Continuous Evaluation	End Sem Exam	Total Marks
4 Hrs.	2	--	50	50	100

Course Objectives:

1.	The objective of the course is to create awareness of practical applications of theoretical concepts learned in Mechanical Engineering.
2.	The objective of the course is to develop managerial, problem-solving, and innovation skills for addressing community and societal issues using engineering solutions.

Course Outcomes:

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

CO1	Apply theoretical knowledge of mechanical engineering to practical, real-life field/community problems.
CO2	Demonstrate organizational, teamwork, and professional practices in field projects.
CO3	Develop communication and documentation skills while working in project groups.

Marks distribution of Internal Marks:

SN	NAME OF ACTIVITY	EXPECTED WORK	ALLOTTED MARKS
1	Seminar-1	Title finalization, justification of topic (Field Project / Mini Project / Case Study)	10
2	Progress Review / Student Diary	Literature Review, weekly progress record, group contribution	10
3	Seminar-2	Mid-term presentation of work progress / case study findings / prototype design	10
4	Final Report & Documentation	Submission of complete report with analysis, results, references	10
5	Final Presentation & Viva	Group presentation with demonstration / case study outcome, Q&A	10
		TOTAL	**50**

SYLLABUS

Following guidelines may be used for the mini-project allotment.

The knowledge and concepts related to engineering acquired by the students has to be implemented in the form of some practical social work.

1. The institute will take care the research and topic interest of each student and it offers flexibility to the student for formation of groups according to their choice of particular interest. However, it is advised them to follow limitation of group members (five to six students per group).
2. In the due course of time, students will carry out a literature review about their area of interest and identify the scope of work by deciding the topic in consultation with the coordinator. The field project/Mini Project/Case study should be industry oriented; application, product, research, review, etc. Title of field project/Mini Project/Case should be basis on the feasibility study of the project.
3. The project may have analytical approach in respective discipline area or interdisciplinary domain.
4. Progress seminars are conducted wherein the students will present their progress of the work before the project review committee. The committee will evaluate their work with respect to the following rubrics:
   A. Understanding the background and topic/Content of the progress report or seminar
   B. Knowledge about existing system/Literature Review
   C. Technical design and findings of the system/technical content
   D. Technical Report writing
   E. Presentation skills /Viva voice
5. Contents of Presentation/reports at the time of Internal examinations shall have:
   A. Index
   B. Introduction
   C. Objectives
   D. Literature Review / Methodology
   E. Working model / analysis / design details / case study outcomes
   F. Results & Discussion
   G. Conclusion (with societal benefit)
   H. Reference.