Maharashtra Institute of Technology

Chhatrapati Sambhajinagar

(An Autonomous Institute)

Affiliated to

Dr. Babasaheb Ambedkar Marathwada University,

Chhatrapati Sambhajinagar, Maharashtra (India)

Curriculum

for

Multi-Disciplinary Minor (MDM)

(NEP 2020 Based Curriculum)

[For Second Year B. Tech Students]

(Revised Pattern for students admitted in S. Y. B. Tech in AY 2025-26)

WEF AY 2025-26

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1. Introduction:

As per the Directives of **Department of Higher and Technical Education (DHTE), Government of Maharashtra:** Government Resolution – NEP/2022/(67/23)/ Tashi-2. Dated 04 July 2023 (Annexure) (Page 1-15), Maharashtra Institute of Technology, Chhatrapati Sambhajinagar has designed the credit framework under Four-Years UG Engineering Programme. In line with the same directives and as per the approval from the respective Board of Studies and Academic Council, various departments are offering different verticals under the mandatory Multidisciplinary minor category with total 14 Credits.

2. Guidelines for choosing the MDM vertical and mandatory to complete

Multi-disciplinary Minor (MDM) verticals are **offered by various departments** and it is to be opted by the other department students. The general guidelines to be noted while completing the MDM courses are as below.

1. **Student has to choose <u>any one</u> MDM Vertical as per eligibility criteria mentioned in Table 1 at semester III.**
2. **Multidisciplinary Minor Verticals offered by department are given in Table 2.**
3. **Student cannot change the MDM Vertical in the subsequent semesters.**
4. **It is mandatory to successfully complete all MDM courses in the same vertical.**
5. **Student has to follow the instructions as per the Head of Department/Course Teacher of Offering Department.**
6. **Student has to take care while filling the examination form and appearing the examination in the opted MDM.**

Table 1: Mandatory Multi-disciplinary Minor (MDM) Option selection Matrix

Sr. No.	B. Tech Program → / MDM Verticals ↓	Agri	AIDS	Civil	CSD	CSE	EED	ECE	ETC	MECH	MTX	PPE
1	Computer Engineering	✓	X	✓	X	X	✓	X	✓	✓	✓	✓
2	Mechanical Engineering	✓	✓	✓	✓	✓	✓	✓	✓	X	X	✓
3	Civil Engineering	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	✓
4	Electronics Engineering	✓	✓	✓	✓	✓	✓	X	X	✓	X	✓
5	Electrical Engineering	✓	✓	✓	✓	✓	X	✓	✓	✓	X	✓
6	Agricultural Engineering	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
7	Plastic and Polymer Engineering	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X

X indicates that students from the discipline (mentioned in the column) are not allowed to opt the option of MDM vertical (Mentioned in the row)

✓ indicates that students from the discipline (mentioned in the column) are allowed to opt the option of MDM vertical (Mentioned in the row)

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3. Multi- Disciplinary Minor Vertical offered by various departments

Multi-disciplinary Minor (MDM) verticals are **offered by various departments** and its Curriculum structure are given in **Table 2**. These MDMs are offered from **SECOND** year onwards wef AY 2025-26.

Table 2: Multidisciplinary Minor Verticals

Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Computer Engineering (Offered by Computer Science and Engineering Department)	1	III	CSE212	Computer Architecture	2	-	-	2	2
	2	IV	CSE262	Introduction to Artificial Intelligence	2	-	-	2	2
	3	V	CSE311	Linux Operating System	3	-	-	3	3
	4	V	CSE336	Linux Operating System Laboratory	-	-	2	2	1
	5	VI	CSE362	Fundamentals of Machine Learning	3	-	-	3	3
	6	VI	CSE387	Fundamentals of Machine Learning Laboratory	-	-	2	2	1
	7	VII	CSE436	Minor Project	-	-	4	4	2
								Total Credits	14

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Multidisciplinary Minor Verticals	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Mechanical Engineering (Offered by Mechanical Engineering Department)	1	III	MED212	Industrial Engineering	2	-	-	2	2
	2	IV	MED262	Fundamentals of Engineering Design	2	-	-	2	2
	3	V	MED311	Energy Management	3	-	-	3	3
	4	V	MED336	Energy Management - Lab	-	-	2	2	1
	5	VI	MED361	Metrology & Quality Control	3	-	-	3	3
	6	VI	MED386	Metrology and Quality Control - Lab	-	-	2	2	1
	7	VII	MED436	Minor Project	-	-	4	4	2
								Total Credits	14

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Table 2: Multidisciplinary Minor Verticals …

Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Civil Engineering (Offered by Civil Engineering Department)	1	III	CED212	Fundamentals of Civil Engineering	2	-	-	2	2
	2	IV	CED262	Climate Change Studies	2	-	-	2	2
	3	V	CED311	Smart Cities and Technologies	3	-	-	3	3
	4	V	CED336	Smart Cities and Technologies Lab	-	-	2	2	1
	5	VI	CED361	Software Applications in Civil Engineering	3	-	-	3	3
	6	VI	CED386	Software Applications in Civil Engineering Lab	-	-	2	2	1
	7	VII	CED436	Minor Project	-	-	4	4	2
								Total Credits	14

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Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Electronics Engineering (Offered by Electronics and Computer Engineering Department)	1	III	ECE212	Electronic Devices	2	-	-	2	2
	2	IV	ECE262	Introduction to Digital Electronics	2	-	-	2	2
	3	V	ECE311	Embedded System Application	3	-	-	3	3
	4	V	ECE336	Embedded System Application Lab	-	-	2	2	1
	5	VI	ECE361	Communication Systems	3	-	-	3	3
	6	VI	ECE386	Communication Systems Lab	-	-	2	2	1
	7	VII	ECE436	Minor Project	-	-	4	4	2
								Total Credits	14

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Table 2: Multidisciplinary Minor Verticals …

Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Electrical Engineering (Offered by Electrical Engineering Department)	1	III	EED212	Electrical Machines	2	-	-	2	2
	2	IV	EED262	Electrical Measurement	2	-	-	2	2
	3	V	EED311	Transmission and Distribution of Electrical Power	3	-	-	3	3
	4	V	EED336	Transmission and Distribution of Electrical Power Lab	-	-	2	2	1
	5	VI	EED361	Testing and Maintenance of Electrical Equipment	3	-	-	3	3
	6	VI	EED386	Testing and Maintenance of Electrical Equipment Lab	-	-	2	2	1
	7	VII	EED436	Minor Project	-	-	4	4	2
								Total Credits	**14**

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Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Agricultural Engineering (Offered by Agricultural Engineering Department)	1	III	AED212	Environmental Impact Assessment	2	-	-	2	2
	2	IV	AED262	Climate Change in Agriculture	2	-	-	2	2
	3	V	AED311	Introduction to Agrotech and Sustainability	3	-	-	3	3
	4	V	AED336	Agri-Data Analysis Lab	-	-	2	2	1
	5	VI	AED361	IoT and Automation in Agriculture	3	-	-	3	3
	6	VI	AED386	Sensor and Drone Application Lab	-	-	2	2	1
	7	VII	AED437	GIS and RS in Agriculture Lab	-	-	4	4	2
								Total Credits	**14**

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Table 2: Multidisciplinary Minor Verticals …

Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Plastic and Polymer Engineering (Offered by Plastic and Polymer Engineering Department)	1	III	PPE212	Introduction to Polymer Science and Technology	2	-	-	2	2
	2	IV	PPE262	Polymeric Materials	2	-	-	2	2
	3	V	PPE312	Polymer Processing and Testing	3	-	-	3	3
	4	V	PPE337	Polymer Processing and Testing Laboratory	-	-	2	2	1
	5	VI	PPE362	3D Printing with Polymers	3	-	-	3	3
	6	VI	PPE387	3D Printing with Polymers Laboratory	-	-	2	2	1
	7	VII	PPE436	Minor Project	-	-	4	4	2
								Total Credits	**14**

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Detail Course Curriculum

for

Multi-disciplinary Minor courses for III and IV semester

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Multidisciplinary Minor Vertical- Computer Engineering

(Offered by Department of Computer Science and Engineering)

For other department/program students

WEF AY 2025-26 (Second year B. Tech)

Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Computer Engineering (Offered by Computer Science and Engineering Department)	1	III	CSE212	Computer Architecture	2	-	-	2	2
	2	IV	CSE262	Introduction to Artificial Intelligence	2	-	-	2	2
	3	V	CSE311	Linux Operating System	3	-	-	3	3
	4	V	CSE336	Linux Operating System Laboratory	-	-	2	2	1
	5	VI	CSE362	Fundamentals of Machine Learning	3	-	-	3	3
	6	VI	CSE387	Fundamentals of Machine Learning Laboratory	-	-	2	2	1
	7	VII	CSE436	Minor Project	-	-	4	4	2
								Total Credits	14

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Multidisciplinary Minor Vertical- Computer Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Computer Engineering) (Semester III)	
Course Category: MDM Course Code: CSE212 Course: Computer Architecture Teaching Scheme: Theory- 2 Hrs./week Self-Learning Hours: 2 Hrs./week	Credits: 2-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.
Prerequisite	Basic knowledge of digital logic and familiarity with general computer usage.
Objectives	• To introduce the structure and working of basic computer systems. • To explain the roles of processor, memory, and I/O devices in a computer. • To provide foundational knowledge of modern computing concepts like pipelining and multicore processing.
Corse Outcomes	**CO1:** Describe computer architecture and its core components including CPU, memory, and I/O devices. **CO2:** Identify and explain the functions and specifications of major hardware components. **CO3:** Explain instruction execution, memory hierarchy, and data transfer mechanisms. **CO4:** Outline modern processor features like pipelining and multi-core architecture.
Unit-I	**Evolution of Computer Architecture and Performance Trends** Overview of the historical evolution of computing systems, Advancements in microprocessor speed, Performance balancing techniques, Enhancements in chip organization and architecture, Multicore processors, Many Integrated Cores (MICs), General-Purpose Graphics Processing Units (GPGPUs), Development of Intel x86 architecture **(05 Hrs)**
Unit-II	**Introduction to Computer Architecture** Functional units of computer, RAM and types of memory modules, System buses: data, address, control, Computer specifications: GHz, cache, cores ,Von Neumann architecture, Harvard architecture, Instruction cycle: fetch-decode-execute, System and application software **(04 Hrs)**
Unit-III	**Basics of Computer Hardware** Micro-operations and their types, Bus structure and data path, Control unit organization, Hardwired vs. Micro programmed control, Instruction sequencing and timing, Stack organization, Instruction set characteristics, Addressing mode classification, Register Transfer Language (RTL) basics **(05 Hrs)**
Unit-IV	**Processor Organization and Instruction Execution** CPU internal structure, General-purpose and special-purpose registers, ALU overview, Instruction formats, Simple addressing modes: immediate, direct, indirect, Flow of instruction execution **(04 Hrs)**

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Unit-V	**Memory Organization & Input/output Systems** Memory hierarchy: registers to secondary storage, RAM and ROM, Cache memory basics, Virtual memory concept, Paging and memory access time, Primary vs secondary memory Types of input and output devices, I/O communication techniques, Programmed I/O, Interrupt-driven I/O, Basics of DMA, Interfaces: USB, HDMI, SATA, Role of I/O controller **(04 Hrs)**
Unit-VI	**Introduction to Modern Computing Concepts** Factors that determine a computer's speed.,Multi-core processors, Flynn's classification Basics of computer instructions, Concept of pipelining, RISC vs CISC, Overview of modern computing devices **(04 Hrs)**

References

Sr. No.	Title	Author(s)	Publisher	Edition
1	Computer System Architecture	M. Morris Mano	Pearson Education	3rd
2	Computer Organization and Design	John P. Hayes	McGraw Hill Education	5th
3	Computer Organization	Carl Hamacher, Zvonko Vranesic, Safwat Zaky	McGraw Hill	5th
4	Computer Architecture: A Quantitative Approach	John L. Hennessy, David A. Patterson	Morgan Kaufmann	6th
5	Structured Computer Organization	Andrew S. Tanenbaum, Todd Austin	Pearson Education	6th

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2			2						1
CO2	2	1			3						1
CO3	2	2			3						1
CO4	2	1			3						1
AVG	**2**	**1.5**			**2.75**						**1**
Strength	**2**	**2**			**3**						**1**

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Multidisciplinary Minor Vertical- Computer Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Computer Engineering) (Semester IV)	
Course Category: MDM Course Code: CSE262 Course: Introduction to Artificial Intelligence Teaching Scheme: Theory- 2 Hrs./week Self-Learning Hours: 2 Hrs./week	Credits: 2-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.
Prerequisite	Basic knowledge of programming (Python preferred), Understanding of Mathematics fundamentals (Linear Algebra, Probability)
Objectives	To provide foundational knowledge of Artificial Intelligence, enabling students to understand, design, and apply intelligent systems for solving real-world problems.
Corse Outcomes	**Introduction to AI** What is AI? Definitions and goals, History and evolution of AI, Applications of AI in various domains, Types of AI (Narrow, General, Super AI),Challenges and limitations of AI . **(4 hrs)**
Unit-I	**Intelligent Agents and Environments** Agents and their structure, Types of agents: Simple reflex, Model-based, Goal-based, Utility-based, Environments: Deterministic vs. stochastic, static vs. dynamic, PEAS description of AI agents **(4 hrs)**
Unit-II	**Problem Solving and Search Strategies** Problem formulation, Uninformed search strategies: BFS, DFS, Uniform Cost Search, Informed search: Heuristic Search, A*,Constraint Satisfaction Problems (CSP) **(5 Hrs)**
Unit-III	**Knowledge Representation and Reasoning** Introduction to KR, Propositional and First-Order Logic, Semantic networks and frames, Rule-based systems, Forward and backward chaining **(4 Hrs)**
Unit-IV	**Introduction to Machine Learning** Definition and types of ML: Supervised, Unsupervised, Reinforcement, Learning process and model evaluation, Basic ML algorithms: KNN, Decision Trees, Real-life applications of ML **(4 Hrs)**
Unit-VI	**Applications of AI** Natural Language Processing (NLP) basics, Expert systems, AI in games and robotics, AI in daily life: Healthcare, Education, Finance, Ethical issues and future of AI **(5 Hrs)**

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	Sr. No.	Title	Author(s)	Publisher	Edition
Textbooks and Reference Books	T1.	Artificial Intelligence: A Modern Approach	Stuart Russell & Peter Norvig	Pearson Education.	4th
	T2.	Artificial Intelligence	Elaine Rich, Kevin Knight, Shivashankar B Nair	McGraw Hill	3rd
	R1.	A First Course in Artificial Intelligence	Deepak Khemani	McGraw Hill.	1st
	R2	Artificial Intelligence: A New Synthesis,	Nils J. Nilsson	Morgan Kaufmann.	1st
	R3	Machine Learning	Tom M. Mitchell	McGraw Hill	1st

Course Outcomes:

CO1: Understand the foundations, history, goals, types, and applications of AI.
CO2: Describe and differentiate AI agents, their types, and environments.
CO3: Apply search strategies and knowledge representation techniques for problem-solving
CO4: Analyze AI and ML applications in various domains with ethical considerations.

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2									2
CO2	3	3			2						2
CO3	3	3	3	3	3						2
CO4	3	3	3		3	2	3		2		3

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Multidisciplinary Minor Vertical- Mechanical Engineering

(Offered by Department of Mechanical Engineering)

For other department/program students

WEF AY 2025-26 (Second year B. Tech)

Multidisciplinary Minor Verticals	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Mechanical Engineering (Offered by Mechanical Engineering Department)	1	III	MED212	Industrial Engineering	2	-	-	2	2
	2	IV	MED262	Fundamentals of Engineering Design	2	-	-	2	2
	3	V	MED311	Energy Management	3	-	-	3	3
	4	V	MED336	Energy Management - Lab	-	-	2	2	1
	5	VI	MED361	Metrology & Quality Control	3	-	-	3	3
	6	VI	MED386	Metrology and Quality Control - Lab	-	-	2	2	1
	7	VII	MED436	Minor Project	-	-	4	4	2
								Total Credits	14

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Multidisciplinary Minor Vertical- Mechanical Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Mechanical Engineering) (Semester III)	
Course Category: MDM Course Code: MED212 Course: Industrial Engineering Teaching Scheme: Theory- 2 Hrs./week Self-Learning Hours: 2 Hrs./week	Credits: 2-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.
Prerequisite	1. Basic knowledge of engineering systems. 2. Understanding of basics of industry functioning.
Course Objectives	1. To make students aware of the basics and importance of Industrial engineering and management. 2. To provide learners an overview of Industrial engineering and work management techniques and tools used in industries.
Course Outcomes	CO1: Management concepts, principles management, fundamentals, decision-making. CO2: Scientific management, contributions evolution, methods, engineering principles. CO3: Types of organizations, principles, significance organization structure, teamwork, ethical principles. CO4: Productivity, work study, techniques industrial engineering, optimization, productivity improvement. CO5: Work measurement, standard time, time study, estimation, tools usage. CO6: Quality, control charts, work sampling, quality assurance, statistical tools, industrial application.
Unit-I	**Introduction:** Definition and scope of industrial engineering, Functions of industrial engineering department and its organization, Qualities of an industrial engineer, Concept of production and productivity. **(4 Hrs)**
Unit-II	**Concepts of Management:** Functions of Management, Evolution of Management Thought: Taylor's Scientific Management, Fayol's Principles of Management, Douglas Mc-Gregor's Theory X and Theory Y, Maslow's Hierarchy of Human Needs – Systems Approach to Management. **(5Hrs)**
Unit-III	**Designing Organizational Structures:** Concept, Importance and characteristics of organization, Types of organization - Project, matrix and informal organization. Span of control, Delegation of authority. **(4 Hrs)**
Unit-IV	**Productivity & Work Study:** Definition, reasons for low productivity, methods to improve productivity, relation between work-study and productivity.

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	Work Study: Definition, need and scope. **Method-study:** Definition, objectives, step by-step procedure, questioning techniques, charts and diagrams for recording data. Principles of motion economy; Development and installation of new method. **(5 Hrs)**
Unit-V	**Work Measurement:** Definition, various techniques of work-measurement such as work-sampling, stopwatch time study & its procedure, Job selection, Equipment and Forms used for work measurement, need for rating operator, methods of rating, allowances and their types, standard time. Standard data techniques. Work Sampling, Predetermined Motion Time Standards (PMTS). **(4 Hrs)**
Unit-VI	**Quality Control:** Meaning of Quality and Quality Control, Quality of Design, Quality of Conformance and Quality of Performance, Functions of Quality Control, Introduction to Statistical Quality Control-Control Charts and Sampling Plans. **(4 Hrs)**

Textbooks and Reference Books

Sr. No.	Title	Author(s)	Publisher	Edition
1.	Industrial Engineering and Management systems	Dalela, S. and Mansuor Ali	Standard Distributors and Publishers	6th
2.	Industrial Engineering & Management	Philip E Hick	Tata McGraw Hill	2nd
3.	Industrial Engineering and Management	Khanna, O.P.	Khanna Publishers	2020
4.	Motions and Time Standards	Ralph, M. B	John Wiley	7th
5.	ILO - Introduction to Work Study	George Kanawaty	International Labor Office, Geneva	4th
6.	Production Planning Control & Industrial Management	Jain, K.C. and Agarwal, L. N.	Khanna Publishers	8th

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	-	-	2	-	2	-	2	-	-
CO2	2	2	-	-	2	-	2	-	2	-	-
CO3	2	2	-	-	2	-	3	-	3	-	-
CO4	2	3	-	-	3	-	2	-	2	-	-
CO5	2	2	-	-	3	-	2	-	2	-	-
CO6	2	2	-	-	3	-	2	-	2	-	-
Average	**2**	**2.16**	**-**	**-**	**2.5**	**-**	**2.16**	**-**	**2.16**	**-**	**-**

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Multidisciplinary Minor Vertical- Mechanical Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Mechanical Engineering) (Semester IV)	
Course Category: MDM Course Code: MED262 Course: Fundamentals of Engineering Design Teaching Scheme: Theory- 2 Hrs./week Self-Learning Hours: 2 Hrs./week	Credits: 2-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Prerequisite	----
Course Objectives	1. To introduce the fundamental principles of machine design 2. To provide knowledge in computer-aided design and manufacturing (CAD/CAM)
Course Outcomes	CO1: Define the terms related to the machine design and materials. CO2: Explain the principles behind stress analysis, selection of engineering materials, standards and ergonomic considerations in design. CO3: Explain the concept of Computer Aided Design. CO4: Explain the concept of Computer Aided Manufacturing. CO5: Interpret mechanical properties and the role of heat treatment and alloying in selecting appropriate materials for machine components. CO6: Solve the problems of simple stress and strain and geometric transformation.
Unit-I	**Introduction to Machine Design:** Machine Design, Basic Procedure of Machine Design, Basic Requirements of Machine Elements, Traditional Design Methods , Use of Standards in Design, Selection of Preferred Sizes, Aesthetic Considerations in Design, Ergonomic Considerations in Design, Manufacturing Considerations in Design. **(4 Hrs)**
Unit-II	**Concept of Stress & Strain:** Types of Stresses, Types of Strain, Material Properties, Stress-strain Curve, Types of Elastic Constants, Stress Tensor, Stress Invariants, Factor of Safety. **(4 Hrs)**
Unit-III	**Engineering Materials and Applications:** Selection of Material, Types and designation of Cast Iron, BIS System of Designation of Steels, Types of Plain-carbon Steels, Effect of alloying elements, Overseas Standards, Heat Treatment of Steels. **(5 Hrs)**
Unit-IV	**Introduction of Machine Elements, Materials and Applications:** Shaft and Keys, Screws, Coupling, Belt, Clutch, Gears, Bearings, Brakes, Flywheel, springs. **(4 Hrs)**

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Unit-V	**Computer Aided Design (CAD)** Introduction to CAD, Historical Development, Industrial Look at CAD, Application of computers in design, creating manufacturing database, Benefits of CAD, Computer Hardware, Graphic input devices, display devices, Graphics output devices, Central processing unit (CPU), Geometric transformations (2D): translation, scaling, rotation. **5 Hrs)**
Unit-VI	**Computer Aided Manufacturing (CAM):** Introduction to CAM, Group Technology and Cellular Manufacturing, Flexible manufacturing, CNC machines: Structure, types, and working, NC part programming: Manual and computer-assisted, Modern Machining system, automatically programmed tools, DNC, Adaptive control. **(4 Hrs)**

Textbooks and Reference Books

Sr. No.	Title	Author(s)	Publisher	Edition
1.	Design of Machine Elements	V.B. Bhandari	Tata McGraw-Hill	3rd
2.	CAD/CAM: Principles and Applications	P.N. Rao	Tata McGraw-Hill	3rd
3.	A Textbook of Machine Design	P.C. Sharma & D.K. Aggarwal	S.K. Kataria & Sons	1st
4.	Computer Aided Design and Manufacturing	Mikel P. Groover & Emory W. Zimmers	Pearson	1st
5.	Computer Integrated Manufacturing	James A. Rehg & Henry W. Kraebber	Pearson	3rd
6.	Automation, Production Systems and Computer-Integrated Manufacturing	Mikell P. Groover	Pearson	4th
7.	Engineering Materials: Properties and Selection	Kenneth G. Budinski & Michael K. Budinski	Pearson	9th

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-
CO6	3	2	2	-	1	-	-	-	-	-	-
Average	**3**	**2**	**2**	-	**1**	-	-	-	-	-	-

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Multidisciplinary Minor Vertical- Civil Engineering

(Offered by Department of Civil Engineering)

For other department/program students

WEF AY 2025-26 (Second year B. Tech)

Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Civil Engineering (Offered by Civil Engineering Department)	1	III	CED212	Fundamentals of Civil Engineering	2	-	-	2	2
	2	IV	CED262	Climate Change Studies	2	-	-	2	2
	3	V	CED311	Smart Cities and Technologies	3	-	-	3	3
	4	V	CED336	Smart Cities and Technologies Lab	-	-	2	2	1
	5	VI	CED361	Software Applications in Civil Engineering	3	-	-	3	3
	6	VI	CED386	Software Applications in Civil Engineering Lab	-	-	2	2	1
	7	VII	CED436	Minor Project	-	-	4	4	2
								Total Credits	14

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Multidisciplinary Minor Vertical- Civil Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Civil Engineering) (Semester III)	
Course Category: MDM Course Code: **CED212** Course: **Fundamentals of Civil Engineering** Teaching Scheme: Theory- 2 Hrs./week Self-Learning Hours: 2 Hrs./week	**Credits: 2-0-0** In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.
Prerequisite	Basic knowledge of Physics, Mathematics, Engineering graphics, and general awareness of built environments and infrastructure.
Course Objectives	1. Understand the scope, fundamental concepts, and sub-disciplines of civil engineering in the context of modern infrastructure. 2. Develop foundational knowledge of materials, surveying, structural components, and environmental systems used in civil engineering. 3. Recognize the interdisciplinary role of civil engineering in sustainable development, smart infrastructure, and public utility systems.
Course Outcomes	At the end of the course, the student will be able to: CO1: Explain the scope, relevance, and interdisciplinary applications of civil engineering. CO2: Identify and classify commonly used construction materials based on their properties. CO3: Apply basic principles of surveying and interpret measurements using standard instruments. CO4: Describe structural elements, types of loads, and behavior of simple structures. CO5: Illustrate basic concepts of water supply, sanitation, and environmentally sustainable practices. CO6: Summarize the role of civil engineering in transportation systems and smart infrastructure.
Unit-I	**Introduction to Civil Engineering**: Role and significance of civil engineering in society and infrastructure development. Sub-disciplines of civil engineering: Structural, Geotechnical, Environmental, Transportation, and Water Resources Engineering. Importance of civil engineering for non-civil branches (e.g., AI in infrastructure, Smart Cities, disaster resilience). Classification of buildings as per National Building Code (NBC). Functional requirements of buildings. Basics of earthquake-resistant structures and building stability. **Introduction to Disaster Management:** Types of disasters (natural and man-made), Fundamental concepts of disaster preparedness, mitigation, response, and recovery, and the role of civil engineers in disaster risk reduction. Case examples of infrastructure failure and response. Sustainability in civil engineering and its contribution to national development missions (Smart Cities Mission, AMRUT, PMAY, Jal Jeevan Mission, etc.). **(5 Hrs)**

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Unit-II	**Building Materials and Construction Basics:** Properties and uses of common materials: bricks, cement, concrete, steel, timber, and stones, Grades and types of cement and concrete, Introduction to modern materials: composites, polymers, and geosynthetics, Basic material testing principles, Building elements: foundations, walls, roofs, floors, stairs, doors, and windows, Types of masonry and bonds, Finishingworks: plastering, painting, and waterproofing, Site layout, architectural, and Vaastu considerations. **(4 Hrs)**
Unit-III	**Elements of Surveying:** Objectives and principles of surveying, Types of surveys and instruments: chain, compass, plane table, and theodolite, Levelling methods and contouring, Introduction to modern tools: Total Station, GPS, and GIS, Applications of surveying in infrastructure planning and mapping, Basics of topographic maps, Common errors and their corrections in surveying. **(4 Hrs)**
Unit-IV	**Basics of Structural Engineering:** Primary structural elements: beams, columns, slabs, and footings, Types of loads: dead loads, live loads, seismic loads, and wind loads, Load-bearing vs. framed structures, Basic concepts: forces, moments, and equilibrium, Stress-strain relationships, Types of stresses: axial, bending, shear, and torsional, Overview of RCC and steel structures, Structural safety, failure case studies, and introduction to earthquake-resistant design. **(5 Hrs)**
Unit-V	**Water Supply, Sanitation & Environment:** Sources of water and basic treatment processes, Components ofwater distribution systems, Basics of sanitation and urban drainage systems, Introduction to solid waste management in urban areas, Rainwater harvesting methods, Green buildings and environmentally sustainable practices. **(4Hrs)**
Unit-VI	**Infrastructure & Transportation Systems:** Classification of roads and pavement components, Introduction to railway systems, airport layout, and basic bridge structures, Key urban infrastructure elements: drainage, fire safety, elevators, and ventilation, Concepts of Smart Cities and intelligent transportation systems (ITS), Principles of sustainable and inclusive transportation, National initiatives: AMRUT, PMAY, Smart Cities Mission. **(4 Hrs)**

	Sr. No.	Title	Author(s)	Publisher	Edition
Text Books (T)	T1.	Elements of Civil Engineering	Dr. A. A.Kandya	Charotar Publishing House	2011
	T2.	Basic Civil Engineering	M.S. Palanichamy & Manoharan	TataMcGraw-Hill	Latest
	T3.	Fundamentals of Civil Engineering	S. S. Bhavikatti	New Age International	Latest

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	Sr. No.	Title	Author(s)	Publisher	Edition
Reference Books (R) and E-resources (E)	R1.	SurveyingVol.1	B. C. Punmia & Ashok Jain	Laxmi Publications	17th Edition
	R2.	Environmental Engineering	G. S. Birdie & J. S. Birdie	Dhanpat Rai Publishing	Latest
	R3.	Building Materials	P. C. Varghese	PHI Learning	Latest
	R4.	Strength of Materials	R.K.Bansal	Laxmi Publications	Latest
	R5.	Transportation Engineering	C. Jotin Khisty & B.K. Lall	Prentice Hall India	Latest
	R6.	Disaster Management	Harsh K.Gupta	University Press	Latest Edition
	E1.	NPTEL Course on *Geo Spatial Analysis in Urban Planning* by IIT Kharagpur, https://nptel.ac.in/courses/105105202			
	E2.	SWAYAM platform for Smart Infrastructure, Surveying, Environment & Sustainability modules, https://swayam.gov.in			
	E3.	BIS National Building Code (NBC) Handbook (Access via BIS e-library or institute subscription) ,https://www.services.bis.gov.in/			
	E4.	Auto desk Education–Free access to software for Civil Engg apps (AutoCAD, Revit, etc.), https://www.autodesk.com/education			
	E5.	National Disaster Management Authority (NDMA) Guidelines and Manuals– https://ndma.gov.in, Includes handbooks for earthquake, flood, cyclone, and urban disaster preparedness (freely downloadable PDFs).			

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	–	–	–	–	2	2	–	–	–	–
CO2	2	–	–	–	–	–	2	–	–	–	–
CO3	2	2	–	2	–	–	–	–	–	–	–
CO4	3	2	–	–	–	–	1	–	–	–	–
CO5	2	–	–	–	–	2	3	–	–	–	–
CO6	2	–	–	–	–	3	3	–	–	–	1

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Multidisciplinary Minor Vertical- Civil Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Civil Engineering) (Semester IV)	
Course Category: MDM Course Code: **CED262** Course: Climate Change Studies Teaching Scheme: Theory- 2 Hrs./week Self-Learning Hours: 2 Hrs./week	**Credits: 2-0-0** In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.
Prerequisite	General understanding of environmental issues, earth systems, or geography
Course Objectives	1. To provide foundational knowledge of climate change science 2. To understand the key components of the Earth's climate system
Course Outcomes	At the end of the course, the student will be able to: CO1: Explain the basic concepts and scientific foundations of climate change. CO2: Identify and differentiate natural and anthropogenic causes of climate change. CO3: Assess climate change impacts on agriculture, health, biodiversity, and water. CO4: Discuss mitigation and adaptation measures including renewable energy CO5: Evaluate case studies and global initiatives for climate change impact assessment. CO6: Interpret government, regional, and community-level actions toward climate solutions
Unit-I	**Introduction**: Definition and basic concepts, Historical context and scientific foundations, Causes of Climate Change, climate change induced hazards, Urban Heat island effect, Human activities driving climate change, Natural factors influencing climate variability, application of space technology in addressing climate change. **(6 Hrs)**
Unit-II	**Climate Science**: Natural vs anthropogenic climate change, Green house gases and radioactive forcing, Carbon and nitrogen cycles. **(3 Hrs)**
Unit-III	**Impacts of Climate Change**: Agriculture and food security, Water resources and hydrology, Human health (heat waves, vector-borne diseases), Ecosystems and biodiversity, Urban systems and infrastructure **(4 Hrs)**
Unit-IV	**Mitigation and Adaptation Strategies:** Renewable energy, energy efficiency, Carbon capture and storage (CCS), Climate- smart agriculture, Ecosystem-based adaptation, Sustainable transportation **(4Hrs)**
Unit-V	**Climate Change Impact Assessment**: Case studies on climate change impact assessment and nature-based treatment, Global, regional and national initiatives in combating climate change. **(4Hrs)**
Unit-VI	**Climate Change and Sustainable Development:** Stories of Success Building Partnership for Climate Change, Experiences: Cross Country, National, Regional and Community, Government initiatives to combat climate change **(5Hrs)**

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	Sr. No.	Title	Author(s)	Publisher	Edition
Text Books (T), Reference Books (R) and E-resources (E)	T1.	Climate Change-Law, Policy and Governance	Usha Tandon	Eastern Book Company	2025-04-02
	T2.	The Climate Solution: India's Climate-Change Crisis and What We Can Do About It	Ramesh, ridula	Hachette India	31 May 2019
	T3.	Climate Change	Sushil Kumar Dash	Cambridge UP	February 15, 2015
	R1.	Global Warming And Climate Change	A. K. Singh	----	2023
	R2.	Climate Change: A Very Short Introduction	Mark Maslin	World Bank/ Earth scan	4th
	R3.	Handbook of climate Change and India	Navroz K. Dubash	Earth scan	2012
	E1	https://dst.gov.in/climate-change-programme			

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	2	-	2
CO2	3	-	-	-	-	-	-	-	2	-	2
CO3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	1	2	2	2	-	-	-	2	-
CO5	3	2	-	3	2	3	2	2	-	2	-
CO6	3	2	-	2	-	3	2	2	-	2	-

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Multidisciplinary Minor Vertical- Electronics Engineering

(Offered by Department of Electronics and Computer Engineering)

For other department/program students

WEF AY 2025-26 (Second year B. Tech)

Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Electronics Engineering (Offered by Electronics and Computer Engineering Department)	1	III	ECE212	Electronic Devices	2	-	-	2	2
	2	IV	ECE262	Introduction to Digital Electronics	2	-	-	2	2
	3	V	ECE311	Embedded System Application	3	-	-	3	3
	4	V	ECE336	Embedded System Application Lab	-	-	2	2	1
	5	VI	ECE361	Communication Systems	3	-	-	3	3
	6	VI	ECE386	Communication Systems Lab	-	-	2	2	1
	7	VII	ECE436	Minor Project	-	-	4	4	2
	Total Credits								**14**

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Multidisciplinary Minor Vertical- Electronics Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Electronics Engineering) (Semester III)	
Course Category: MDM Course Code: ECE212 Course: Electronics Devices Teaching Scheme: Theory- 2 Hrs./week Self-Learning Hours: 2 Hrs./week	~~Credits: 2-0-0~~ In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Prerequisite	Basic Electronics
Objectives	This course will enable students to Understand the basics of semiconductor physics and electronic devices.
Unit-I	**Semiconductor Diodes:** Introduction, Semiconductor materials, covalent bond and intrinsic materials, energy levels, extrinsic materials: p-type and n-type semiconductors, semiconductor diodes, ideal versus practical diodes, resistance levels, diode equivalent circuits, transition and diffusion capacitance, reverse recovery time, diode specification sheet, zener diode, Light Emitting diode, Tunnel diode, schottky diode, varicap diode **(06 Hrs)**
Unit-II	**Diode Circuits:** Introduction, Load –line Analysis, Series Diode configuration, Parallel and series-parallel configurations, Typical diode circuits, Half-wave & Full wave rectifier, Clippers, Clampers, Zener Diode as voltage regulators, Voltage multiplier circuits, Practical Applications of diode circuits **(06 Hrs)**
Unit-III	**Bipolar Junction Transistor:** Introduction, Transistor construction, Operation, Common-base configuration & characteristic, Transistor Amplifying action, Common-Emitter configuration & characteristic, Common collector configuration & characteristic, Limits of operation, study of Transistor data sheet **(06 Hrs)**
Unit-IV	**JFET & MOSFET:** Construction and operation of JFET & MOSFET, noise performances of FET, parasitic of MOSFET, small signal models of JFET & MOSFET. Biasing of JFET's & MOSFET's. Low frequency single stage CS and CD (source follower) JFET amplifiers .FET as voltage variable resistor and active load **(07 Hrs)**
Unit-V	**Small Signal Amplifiers at Low Frequency:** Analysis of BJT and FET multistage amplifier, DC and RC coupled amplifiers. Frequency response of single and multistage amplifier, mid-band gain, gains at low and high frequency. **(07 Hrs)**

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Unit-VI	**Power Amplifiers:** Introduction, series –fed Class A amplifier, Transformer-Coupled Class A amplifier, Class B amplifier operation, Class B amplifier circuits, Amplifier distortion, Class C and Class D amplifier, Heat sink and its operation **(06 Hrs)**

	Sr. No	Title	Author	Publication	Edition
Textbooks and Reference Books	01	Microelectronic Circuits	Sedra, Smith	Oxford University Press	fifth
	02	The art of electronics	Paul Horowitz and Winfield Hill	Cambridge university press	third
	03	Integrated Electronics	Millman & Halkias	McGraw Hill Publications	1992
	04	Electronic Devices & Circuit Theory	Boylestad & Nashlesky	PHI	Tenth
	05	Electronic Principles	Albert Malvino & David J. Bates	Tata McGraw Hill	Seventh
	06	Electronic Devices	Floyd	PHI	Seventh

Course Outcome

CO1	Explain the principles of semiconductor devices and their characteristics.
CO2	Analyze the operation of BJT, JFET, and MOSFET circuits.
CO3	Design small-signal amplifier circuits and evaluate their frequency response.
CO4	Compare different power amplifiers and assess their performance.

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2										
CO2		2									
CO3			3		2						
CO4			3								

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Multidisciplinary Minor Vertical- Electronics Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Electronics Engineering) (Semester IV)	
Course Category: MDM Course Code: ECE262 Course: Introduction to Digital Electronics Teaching Scheme: Theory- 2 Hrs./week Self-Learning Hours: 2 Hrs./week	Credits: 2-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.
Prerequisite	Basic Electronics
Objectives	1.To Study Number systems with its conversions 2.To Study Boolean laws and its use in logic functions minimization 3.To Study Combinational Circuits 4.To Study Sequential circuits
Unit-I	**Number system and coding techniques** Introduction, Number systems: Binary, Octal, Decimal and Hexadecimal, and their Conversion methods, Signed Binary numbers: 1's and 2's complement representation, Binary arithmetic, Codes: Classification, BCD code, Excess-3 code, Gray code **(4 Hrs)**
Unit-II	**Logic Gates, Boolean algebra and minimization techniques** Introduction, Digital Signals, Basic Digital circuits: AND, OR, NOT, NAND, NOR, Exclusive-OR and Exclusive-NOR, Boolean Algebra, De-Morgan's theorems, Simplification using Boolean algebra, Standard representation for logical functions, SOP and POS form, Karnaugh map representation and minimization of logical functions up to 4-variables, don't care conditions. **(4 Hrs)**
Unit-III	**Combinational Logic Circuits I** Code converters: Binary to Gray code converter, Gray to Binary code converter, Design Examples: Arithmetic Circuits, Adders, Subtractors, BCD Adder. **(4 Hrs)**
Unit-IV	**Combinational Logic Circuits II** Block diagram of combinational logic, Multiplexers and their use in combinational logic designs, multiplexer trees, Demultiplexers and their use in combinational logic designs, Demultiplexer trees, decoder, encoder **(5 Hrs)**
Unit-V	**Sequential Logic Circuits** SR, JK, Master Slave J-K flip flop, D and T flip-flops, Excitation Table for flip-flops, Application of Flip flops, **(4 Hrs)**

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Unit-VI	**Shift Registers**: Introduction, Data formats, Register classification, modes of operation of shift register **Counters**: Classification and the design steps, Ripple or asynchronous counter, modulus of counter, UP/DOWN counter **(5 Hrs)**

	Sr. No	Title	Author	Publication	Edition
Textbooks and Reference Books	01	Digital Logic and Computer Design (Reference Book)	M. Marris Mano	PHI, New Delhi	1st
	02	Modern Digital Electronics (Reference Book)	R. P. Jain	Tata Mc-Graw hill	4th
	03	Digital Principles and Application (Text Book)	Malvino and Leach	TMH, New Delhi	4th
	04	Modern Digital Electronics (Text Book)	R.P.Jain	Tata Mc-Graw hill	4th
	05	Digital Electronics (Text Book)	S. K. Mandal	McGraw Hill Education	1st
E-resources link	https://www.youtube.com/playlist?list=PL803563859BF7ED8C https://www.cl.cam.ac.uk/teaching/2122/DigElec/materials.html				

Course Outcome

CO1	Understand number systems, binary arithmetic, Boolean algebra, and minimization techniques for logical functions.
CO2	Apply Boolean laws, K-map techniques, and logic gates to design combinational logic circuits such as adders, subtractors, multiplexers, and decoders
CO3	Analyze the behavior of sequential logic elements such as flip-flops, registers, and counters with their excitation tables and design aspects.
CO4	Design and evaluate combinational and sequential circuits for real-time applications in electronics and computer engineering.

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3										
CO2			3								
CO3	2										
CO4			3								

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Multidisciplinary Minor Vertical- Electrical Engineering

(Offered by Department of Electrical Engineering)

For other department/program students

WEF AY 2025-26 (Second year B. Tech)

Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Electrical Engineering	1	III	EED212	Electrical Machines	2	-	-	2	2
	2	IV	EED262	Electrical Measurement	2	-	-	2	2
	3	V	EED311	Transmission and Distribution of Electrical Power	3	-	-	3	3
	4	V	EED336	Transmission and Distribution of Electrical Power Lab	-	-	2	2	1
(Offered by Electrical Engineering Department)	5	VI	EED361	Testing and Maintenance of Electrical Equipment	3	-	-	3	3
	6	VI	EED386	Testing and Maintenance of Electrical Equipment Lab	-	-	2	2	1
	7	VII	EED436	Minor Project	-	-	4	4	2
								Total Credits	**14**

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Multidisciplinary Minor Vertical- Electrical Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Electrical Engineering) (Semester III)	
Course Category: MDM Course Code: EED212 Course: Electrical Machines Teaching Scheme: Theory- 2 Hrs./week Self-Learning Hours: 2 Hrs./week	Credits: 2-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Prerequisite	Basic electrical Engineering, magnetic circuits.
Objectives	1. To learn how DC machines and motors are built and how they work. 2. To understand how to start, control, and test DC motors safely and effectively. 3. To know the working and uses of different types of motors, including induction and special-purpose motors.
Unit-I	**D.C Motor** Construction, main parts, magnetic circuit, typical flux path, armature winding, simple lap & wave winding, commutator & brush assembly **(04hrs)**
Unit-II	**Starting, Control & Testing of DC Motor.** Starting of DC motors, starters for series & shunt motor, solid state starters speed control, tests, applications **(04hrs)**
Unit-III	**DC Generator And DC Motor Action** Generator and Motor action, emf equation, types, characteristics, applications, torque equation of motor, significance of back emf, working at no load and on load. losses and efficiency. (numerical on EMF equation) **(05hrs)**
Unit-IV	**Induction Motor.** Three Phase Induction Motor: Construction, Principle of operation, torque rate equation and torque ratios, speed torque characteristics, phasor diagram, equivalent circuit, efficiency and losses calculations. **(05Hrs)**
Unit-V	**Single Phase Induction Motor** Double revolving field theory, starting methods, types of single phase motor , application **(03hrs)**
Unit-VI	**Special Purpose Machine** Construction & operating principles of Brush less DC motor (BLDC), Stepper motor, DC Servo motor, PMDC Motor. AC servomotor, synchronous reluctance and Hysteresis motor **(05hrs)**

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	Sr. No.	Title	Author(s)	Publisher	Edition
Textbooks and Reference Books	1.	Electrical Technology	B.L Theraja	Vol-II, Chand Publication	2nd
	2.	Electrical Machines	Nagnath Kothari	TATA McGraw Hill	5th
	3.	Electrical Technologies	Edward Hughes Elbs	Pearson Education	10th

Course Outcome

CO1	Understand the construction and working of DC machines including lap and wave windings.
CO2	Demonstrate the starting, speed control, and testing procedures of DC motors.
CO3	Analyze the generator and motor action, EMF equation, types, losses and efficiencies with numerical problems.
CO4	Understand the construction, operation, and performance of three-phase and single-phase induction motors.
CO5	Explain the purpose and working of special purpose motors like BLDC, stepper, PMDC, servomotors, etc.

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2									1
CO2	3	2									1
CO3	3	2									1
CO4	3										1
CO5	3										1

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Multidisciplinary Minor Vertical- Electrical Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Electrical Engineering) (Semester IV)	
Course Category: MDM Course Code: EED262 Course: Electrical Measurement Teaching Scheme: Theory- 2 Hrs./week Self-Learning Hours: 2 Hrs./week	Credits: 2-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.
Prerequisite	Basic Electrical Engineering
Objectives	1. To understand the concept of measurement and types of measuring instruments. 2. To understand the measurement of Electrical Quantities using Analog and Digital Instruments. 3. To introduce various methods and bridges for measurement of Electrical Parameters. 4. To familiarize with different transducers and the methods for measurement of non-electrical quantities.
Unit-I	**Introduction to Electrical Measurements:** Concepts of Measurements & Measurement Systems: Introduction to measurement and instrumentation, S. I. system, methods of measurement, static and dynamic characteristics of instruments, definitions – true value, accuracy, error, precision, sensitivity, resolution etc. **(04 Hrs)**
Unit-II	**Analog Measuring Instruments:** Analog Electromechanical Instruments: Classification of analog instruments, principle of operation, operating forces, errors in ammeters and voltmeters, Indicating Instruments with it types. **(05 Hrs)**
Unit-III	**Measurement of Electrical Parameters:** Measurement of low, medium and high resistances using Ohm Meter, Voltmeter Ammeter, Bridge, Megger, Measurement of Earth Resistance and Insulation Resistance. measurement of inductance & capacitance with the help of AC Bridges **(05 Hrs)**
Unit-IV	**Instrument Transformers and Power Measurement:** Current transformer (CT) and Potential transformer (PT): construction, working, and applications Ratio and phase angle errors Advantages and limitations of instrument transformers Power measurement in 3-phase systems using two-wattmeter metho Measurement of reactive power **(04 Hrs)**
Unit-V	**Electronic and Digital Instruments:** Electronic voltmeters: types and advantages Digital voltmeters and multimeters Digital frequency meters and time interval meters Signal conditioning and filters Block diagram of digital storage oscilloscope (DSO), applications of DSO **(04 Hrs)**
Unit-VI	**Transducers and Data Acquisition:** Introduction to transducers – classification and characteristics Resistive, capacitive, and inductive transducers Thermocouples, RTDs, LVDTs, strain gauges Data acquisition systems: block diagram and working Introduction to smart sensors and measurement automation **(04 Hrs)**

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	Sr. No.	Title	Author(s)	Publisher	Edition
Textbooks and Reference Books	1	A course in Electrical & Electronic Measurement and Instrumentation	A.K.Sawhney	Dhapat Rai & Co	9th
	2	A Course in Electronics and Electrical Measurements and Instrumentation	J B Gupta	S.K. Kataria & Sons	14th
	3	Electronic Instrumentation	H. S. Kalsi	McGraw Hill	4th
	4	Electronic Instrumentation and Measurements	David A. Bell	Oxford University Press	3rd

Course Outcome

CO1	Understand the fundamental concepts of electrical measurement systems and associated terminology.
CO2	Explain the working principles and types of analog and digital measuring instruments.
CO3	Measure electrical parameters such as resistance, inductance, and capacitance using standard bridge methods.
CO4	Analyze and interpret power measurement techniques in three-phase systems using instrument transformers.
CO5	Evaluate performance and application of modern electronic and digital measuring instruments.
CO6	Demonstrate the use of transducers and data acquisition systems for measurement of non-electrical quantities.

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	-	-	1	-	-	-	-	-	-	
CO2	3	2	-	2	-	-	-	-	-	-	
CO3	3	2	1	2	-	-	-	-	-	-	
CO4	3	2	1	3	-	-	-	-	-	1	
CO5	3	2	2	3	2	-	-	-	-	1	
CO6	3	2	2	3	2	-	-	-	-	1	
Average	3	2	1.5	2.33	2					1	

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Multidisciplinary Minor Vertical- Agricultural Engineering

(Offered by Department of Agricultural Engineering)

For other department/program students

WEF AY 2025-26 (Second year B. Tech)

Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Agricultural Engineering (Offered by Agricultural Engineering Department)	1	III	AED212	Environmental Impact Assessment	2	-	-	2	2
	2	IV	AED262	Climate Change in Agriculture	2	-	-	2	2
	3	V	AED311	Introduction to Agrotech and Sustainability	3	-	-	3	3
	4	V	AED336	Agri-Data Analysis Lab	-	-	2	2	1
	5	VI	AED361	IoT and Automation in Agriculture	3	-	-	3	3
	6	VI	AED386	Sensor and Drone Application Lab	-	-	2	2	1
	7	VII	AED437	GIS and RS in Agriculture Lab	-	-	4	4	2
								Total Credits	**14**

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Multidisciplinary Minor Vertical- Agricultural Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Agricultural Engineering) (Semester III)	
Course Category: MDM Course Code: AED212 Course: Environmental Impact Assessment Teaching Scheme: Theory- 2 Hrs./week Self-Learning Hours: 2 Hrs./week	**Credits: 2-0-0** In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.
Prerequisite	Environmental science and concept of ecology.
Objectives	1. Students would overview the concepts, methods, issues, and various forms and stages of EIA process. 2. Students will be able to examine the development of EIA in India and highlight the diversity of approach and impact of the EIA process.
Unit-I	**Introduction and Evolution of EIA:** Introduction to Environmental Impact Assessment, Origin of EIA, Stages in EIA, thorough discussion of steps in EIA. **Establishments of Procedure:** Legislative Option, Project Screening for EIA, Public Participation in EIA process. **(02 Hrs)**
Unit-II	**Impact assessment:** Background information, IA methods, environmental impact assessment methodology, documentation and selection process, environmental indices and indicators for describing the affected environment, and Life cycle assessment. **(04 Hrs)**
Unit-III	**Air and noise environment:** Prediction and assessment of impact for air and noise environment, Basic information of air quality, identification of type and quantity of air pollutant, existing air quality and air quality standards, impact prediction and assessment, mitigation. Basic information of noise, existing noise levels and standards, prediction of noise levels and assessment of impact, mitigations. **(05 Hrs)**
Unit-IV	**Water and soil environment:** Prediction and assessment of impact for water and soil environment, Basic information of water quality (Surface water and groundwater), water quality standards, identification of impact, prediction of impact and assessment, mitigations. Background information of soil environment, soil, and groundwater standards, prediction and assessment of impact for groundwater and soil, mitigations. **(05 Hrs)**
Unit-V	**Decision Methods for Evaluating Alternative:** Public participation in environmental decision-making, Regulatory requirements, environmental impact assessment process, objectives of public participation, and verbal communication in EIA studies. **(05 Hrs)**

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Unit-VI	**Transducers and Data Acquisition:** Introduction to transducers – classification and characteristics Resistive, capacitive, and inductive transducers Thermocouples, RTDs, LVDTs, strain gauges Data acquisition systems: block diagram and working Introduction to smart sensors and measurement automation **(04 Hrs)**

Textbooks and Reference Books	**Sr. No.**	**Title**	**Author(s)**	**Publisher**	**Edition**
	1.	Environmental Impact Assessment	Canter R.L.	Mc Graw Hill International	1st
	2.	Environmental Impact Assessment Theory and Practice	Peter Watten (Eds.)	Unwin Hyman	2nd
	3.	Environmental Impact Assessment	R.R. Barthwal	New Age International	1St
	4.	Environmental Impact Analysis Handbook	John G. Rau and David C. Wooten	McGraw Hill Book Company	1St

Course Outcome

CO1	Describe the evolution, steps, and procedures involved in the Environmental Impact Assessment (EIA) process. (Level: Remembering)
CO2	Explain the methods of impact assessment including environmental indices, indicators, and life cycle assessment. (Level: Understanding)
CO3	Analyze the potential impacts on air and noise environments and propose mitigation strategies. (Level: Analyzing)
CO4	Evaluate the effects of development projects on water and soil environments with mitigation approaches. (Level: Evaluating)
CO5	Justify the role of public participation and decision-making methods in EIA. (Level: Evaluating)
CO6	Develop a structured EIA report based on MoEFCC guidelines and recent notifications. (Level: Creating)

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	1	--	--	--	--	1	--	--	2
CO2	2	3	2	--	--	--	--	2	--	--	2
CO3	--	3	3	1	2	--	--	2	--	--	3
CO4	--	2	3	2	2	--	--	2	--	--	3
CO5	--	1	2	3	2	2	1	2	--	--	3
CO6	--	2	2	3	2	3	1	3	1	1	3

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Multidisciplinary Minor Vertical- Agricultural Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Agricultural Engineering) (Semester IV)	
Course Category: MDM Course Code: **AED262** Course: Climate Change in Agriculture Teaching Scheme: Theory- 2 Hrs./week Self-Learning Hours: 2 Hrs./week	~~Credits: 2-0-0~~ In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.
Prerequisite	Basic knowledge of environmental science ~~Fundamental understanding of agricultural practices~~
Objectives	1. To comprehend the effects of climate change on agricultural systems and food security. 2. To learn and evaluate various strategies for mitigating and adapting to climate change in agricultural contexts. 3. To gain insights into climate-smart agricultural practices and their implementation for sustainable farming.
Unit-I	**Introduction to Climate Change:** Definition, causes, and consequences of climate change; historical and current trends in global climate patterns; the greenhouse effect and global warming. **(04 Hrs)**
~~**Unit-II**~~	**Impact of Climate Change on Agriculture:** How climate change affects crop production, soil health, water resources, and pest/disease dynamics; case studies of affected regions and crops. **(04 Hrs)**
Unit-III	**Mitigation Strategies in Agriculture:** Practices to reduce greenhouse gas emissions: sustainable farming practices, carbon sequestration, renewable energy use, and policy measures. ~~**(04 Hrs)**~~
Unit-IV	**Adaptation Strategies in Agriculture:** Techniques for adapting agricultural practices to changing climate conditions: crop diversification, irrigation management, soil conservation, and breeding resilient crops. **(05 Hrs)**
Unit-V	**Climate-Smart Agriculture (CSA):** Overview of CSA, its principles, and practices; integrating CSA into agricultural policies and programs; case studies of CSA implementation around the world. **(05 Hrs)**
Unit-VI	**Future of Agriculture in a Changing Climate:** Predicting future climate scenarios and their potential impact on agriculture; research and innovation in climate-resilient agricultural practices. **(04 Hrs)**

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	Sr. No.	Title	Author(s)	Publisher	Edition
Textbooks and Reference Books	1.	Climate Change: The Science, Impacts and Solutions	A. Barrie Pittock	CSIRO Publishing	2nd
	2.	Climate Change and Crop Production	Matthew P. Reynolds	CABI Publishing	1st
	3.	Climate Change Mitigation and Agriculture	Eva Wollenberg, M.L. Tapio-Bistrom, Michael Main	Earthscan Publications	1st
	4	Adapting Agriculture to Climate Change	Chris Stokes, Mark Howden	CSIRO Publishing	1st
	5	Climate-Smart Agriculture: Building Resilience to Climate Change	Leslie Lipper, Nancy McCarthy, David Zilberman, Solomon Asfaw, Giacomo Branca	Springer	1st
	6.	Agriculture and Climate Beyond 2015	J.S. Samra, P.S. Minhas, Raj K. Gupta	Indian Council of Agricultural Research	1st

Course Outcome

CO1	Describe the causes, consequences, and historical trends related to climate change. (Level: Remembering)
CO2	Analyze the impact of climate change on agriculture including crops, soil, water, and pests. (Level: Analyzing)
CO3	Evaluate mitigation strategies in agriculture for reducing greenhouse gas emissions. (Level: Evaluating)
CO4	Apply adaptive strategies to agricultural practices under changing climate conditions. (Level: Applying)
CO5	Explain climate-smart agriculture and its integration into policies and programs. (Level: Understanding)
CO6	Predict future climate scenarios and propose innovative climate-resilient farming solutions. (Level: Creating)

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	1	--	--	--	--	2	--	--	2
CO2	2	3	3	1	1	--	--	2	--	--	3
CO3	1	2	3	2	3	2	1	2	1	--	3
CO4	--	2	3	3	2	2	1	2	1	1	3
CO5	1	2	2	2	2	2	2	2	1	1	3
CO6	--	1	2	3	2	3	3	3	2	2	3

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Multidisciplinary Minor Vertical- Plastic and Polymer Engineering

(Offered by Department of Plastic and Polymer Engineering)

For other department/program students

WEF AY 2025-26 (Second year B. Tech)

Multidisciplinary Minor Vertical	Sr. No.	Semester	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits
Plastic and Polymer Engineering (Offered by Plastic and Polymer Engineering Department)	1	III	PPE212	Introduction to Polymer Science and Technology	2	-	-	2	2
	2	IV	PPE262	Polymeric Materials	2	-	-	2	2
	3	V	PPE312	Polymer Processing and Testing	3	-	-	3	3
	4	V	PPE337	Polymer Processing and Testing Laboratory	-	-	2	2	1
	5	VI	PPE362	3D Printing with Polymers	3	-	-	3	3
	6	VI	PPE387	3D Printing with Polymers Laboratory	-	-	2	2	1
	7	VII	PPE436	Minor Project	-	-	4	4	2
								Total Credits	**14**

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Multidisciplinary Minor Vertical- Plastic and Polymer Engineering

(Offered by Plastic and Polymer Engineering Department)

WEF 2025-26 (NEP 2020 Based Curriculum)

Faculty of Science & Technology **Syllabus of Multidisciplinary Minor (Plastic and Polymer Engineering) (Semester III)**	
Course Category: **MDM** Course Code: **PPE212** Course: **Introduction to Polymer Science and Technology** Teaching Scheme: Theory- 2 Hrs./week Self-Learning Hours: 2 Hrs./week	**Credits: 2-0-0** In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.
Prerequisite	Fundamental knowledge of chemistry.
Objectives	1. General overview of polymers, their types, concept of molecular weight. 2. General understanding of structure of polymers and predict polymer properties.
Unit-I	**Introduction:** Historical developments of different polymers – a general overview, basic raw materials, concepts and definitions of monomers, macromolecules, polymers, repeating units, degree of polymerization, functional groups. **(03 Hrs)**
Unit-II	**Classification of Polymers:** Basic concepts and definitions of: organic and inorganic, thermoplastics and thermosets, addition and condensation, natural, semi-synthetic and synthetic, crystalline and amorphous, homopolymers and copolymers, homochain and heterochain, linear, branched and cross-linked. **(04 Hrs)**
Unit-III	**Synthesis of Polymers:** Brief idea of polymerization techniques: Bulk, solution, suspension, emulsion, interfacial. **(04 Hrs)**
Unit-IV	**Mechanical and Thermal Properties:** Effect of crystallinity, molecular weight, cross link density and additives on modulus of elasticity, tensile strength, flexural strength, impact strength, yield strength, fracture toughness. Transition temperature in polymers: melting temperature (T_m) and glass transition temperature (T_g), factors affecting T_m and T_g. **(05 Hrs)**
Unit-V	**Electrical and Optical Properties:** Effect of polymer structure on dielectric constant, power factor, dissipation factor, loss factor, electrical conductivity, static charges, resistivity and arc resistance of polymers. Effect of polymer structure on optical properties, viz. clarity, transparency, haze, transmittance, absorbance, gloss. **(05 Hrs)**

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Unit-VI	**Chemical Properties:** Effects of polymer structure on solubility in different solvents, concept of cohesive energy and solubility parameter, chemical resistance of polymers, diffusion and permeability. **(05 Hrs)**

Textbooks and Reference Books

Sr. No.	Title	Author(s)	Publisher	Edition
1.	Polymer Science and Technology: Plastics, Rubber, Blends and Composites	Premamoy Ghosh	Tata McGraw Hill	2nd
2.	Plastics Materials	J. Brydson	Butterworth Heinemann	7th
3.	Introduction to Polymer Science and Chemistry :A Problem-Solving Approach	Manas Chanda	CRC Press	2nd
4.	Principles of Polymerization	George Odian	Wiley Interscience	4th
5.	Textbook of Polymer Science	F. W. Billmeyer	Wiley Interscience	3rd
6.	Polymer Science	V. R. Gowarikar	New Age International	3rd

Course Outcome

CO1	Define the basic terminologies like molecular weight, macromolecules, functionality, crystallinity, glass transition temperature and degree of polymerization.
CO2	Classify the polymers based on origin, structures, thermal behavior and applications.
CO3	Summarize the different polymerization techniques.
CO4	Recall the mechanical, thermal, electrical, optical and chemical properties of polymers.

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2					1			1		1
CO2	2					1			1		1
CO3	2	1				1			1		1
CO4	2	1	1			1			1		1

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Multidisciplinary Minor Vertical- Plastic and Polymer Engineering

(Offered by Plastic and Polymer Engineering Department)

WEF 2025-26 (NEP 2020 Based Curriculum)

Faculty of Science & Technology **Syllabus of Multidisciplinary Minor (Plastic and Polymer Engineering) (Semester IV)**	
Course Category: **MDM** Course Code: **PPE262** **Course: Polymeric Materials** Teaching Scheme: Theory- 2 Hrs./week Self-Learning Hours: 2 Hrs./week	**Credits: 2-0-0** In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.
Prerequisite	Fundamental knowledge of chemistry.
Objectives	1. Different polymeric materials, their types. 2. General properties, processing behavior and applications of different class of polymeric materials. 3. Structure-property relationship of different classes of polymer.
Unit-I	**Natural Polymers:** Properties and applications of natural polymers - cellulosics – Regenerated cellulose, cellulose nitrate, cellulose acetate, ethyl cellulose, silk, shellac. **(03 Hrs)**
Unit-II	**Commodity Plastics-I:** Properties and applications of polyethylene – LDPE, LLDPE, HDPE, Polyvinyl Chloride. **(04 Hrs)**
Unit-III	**Commodity Plastics-II:** Properties and applications of Polypropylene, Polystyrene, Polyethylene terephthalate. **(04 Hrs)**
Unit-IV	**Engineering Plastics:** Properties and applications of Polymethyl Methacrylate, Nylons, Polycarbonate. **(05 Hrs)**
Unit-V	**Thermosetting Resins:** Properties and application of phenol formaldehyde (PF) resins (Novolac, Resol), Melamine Formaldehyde (MF) and Urea Formaldehyde (UF) resins. **Epoxies** Properties and application of epoxies. **(05 Hrs)**
Unit-VI	**Recent Advancements in Polymers:** Liquid crystalline polymers, Conducting polymers, High Temperature resistant Polymers, Polymers used in medical field, nuclear science, defense etc. **(05 Hrs)**

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	Sr. No.	Title	Author(s)	Publisher	Edition
Textbooks and Reference Books	1.	Polymer Science and Technology	P. Ghosh	Tata McGraw Hill	2nd
	2.	Plastics Materials	J Brydson	Butterworth Hienemann	7th
	3.	Introduction to Polymers	Young, R. J., and P. A. Lovell	CRC Press	2nd
	4.	Polyesters and polyamides	B. L. Deopura, R. Alagirusamy, M. Joshi, B. Gupta	Woodhead Publishing in Textiles	1st

Course Outcome

CO1	Recall the properties and applications of natural polymers.
CO2	Summarize the properties and applications of Commodity and Engineering plastics.
CO3	Identify the type of thermosetting materials on the basis of its physical and chemical characteristics and behavior.
CO4	State the properties and applications of various advanced polymeric materials.

CO and PO Mapping: (3-Strong, 2-Medium and 1- Low)

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2					1			1		1
CO2	2					1			1		1
CO3	2								1		1
CO4	2					1			1		1

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Dr. Ajij D. Sayyad, Dean (Academics)

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