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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 Third Year B. Tech Students AY 2025-26]

(Specifically for students admitted in S. Y. B. Tech in AY 2024-25)

WEF AY 2025-26

INDEX

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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 V.**
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 third year onwards wef AY 2025-26, for the students those completed the Second year in AY 2024-25 or before it.

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	V	CSE311	Linux Operating System	3	-	-	3	**3**
	2	V	CSE336	Linux Operating System Laboratory	-	-	2	2	**1**
	3	VI	CSE361	Computer Network and Security	3	-	-	3	**3**
	4	VI	CSE386	Computer Network and Security Laboratory	-	-	2	2	**1**
	5	VII	CSE411	Fundamentals of Machine Learning Techniques	3	1	-	4	**4**
	6	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	V	MED311	Energy Management	3	-	-	3	3
	2	V	MED336	Energy Management Lab	-	-	2	2	1
	3	VI	MED361	Metrology & Quality Control	3	-	-	3	3
	4	VI	MED386	Metrology & Quality Control Lab	-	-	2	2	1
	5	VII	MED411	Industrial Engineering	3	1	-	4	4
	6	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	V	CED311	Smart Cities and Technologies	3	-	-	3	3
	2	V	CED336	Smart Cities and Technologies Lab	-	-	2	2	1
	3	VI	CED361	Software Application in Civil Engineering	3	-	-	3	3
	4	VI	CED386	Software Application in Civil Engineering Lab	-	-	2	2	1
	5	VII	CED411	Construction Management	3	1	-	4	4
	6	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	V	ECE311	Embedded System Application	3	-	-	3	3
	2	V	ECE336	Embedded System Application Lab	-	-	2	2	1
	3	VI	ECE361	Communication Systems	3	-	-	3	3
	4	VI	ECE386	Communication Systems Lab	-	-	2	2	1
	5	VII	ECE411	Internet of Things	3	1	-	4	4
	6	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	V	EED311	Transmission and Distribution of Electrical Power	3	-	-	3	3
	2	V	EED336	Transmission and Distribution of Electrical Power Lab	-	-	2	2	1
	3	VI	EED361	Testing and Maintenance of Electrical Equipment	3	-	-	3	3
	4	VI	EED386	Testing and Maintenance of Electrical Equipment Lab	-	-	2	2	1
	5	VII	EED411	Fundamentals of Rooftop Solar System Design	3	1	-	4	4
	6	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	V	AED311	Introduction to Agrotech and Sustainability	3	-	-	3	3
	2	V	AED336	Agri-Data Analysis Lab	-	-	2	2	1
	3	VI	AED361	IoT and Automation in Agriculture	3	-	-	3	3
	4	VI	AED386	Sensor & Drone Application Lab	-	-	2	2	1
	5	VII	AED411	Remote Sensing and GIS	3	1	-	4	4
	6	VII	AED436	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
Plastic and Polymer Engineering (Offered by Plastic and Polymer Engineering Department)	1	V	PPE311	Polymeric Materials and Testing	3	-	-	3	3
	2	V	PPE336	Polymeric Materials and Testing Lab	-	-	2	2	1
	3	VI	PPE361	Polymer Processing Techniques	3	-	-	3	3
	4	VI	PPE386	Polymer Processing Techniques Lab	-	-	2	2	1
	5	VII	PPE411	3D Printing with Polymers	3	1	-	4	4
	6	VII	PPE436	Minor Project	-	-	4	4	2
								Total Credits	14

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Detail Course Curriculum

for

Multi-disciplinary Minor courses for V and VI 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 (Third year B. Tech Onwards)

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	V	CSE311	Linux Operating System	3	-	-	3	3
	2	V	CSE336	Linux Operating System Laboratory	-	-	2	2	1
	3	VI	CSE361	Computer Network and Security	3	-	-	3	3
	4	VI	CSE386	Computer Network and Security Laboratory	-	-	2	2	1
	5	VII	CSE411	Fundamentals of Machine Learning Techniques	3	1	-	4	4
	6	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 V)	
Course Category: MDM Course Code: **CSE 311** **Course: Linux Operating System** Teaching Scheme: Theory- 3 Hrs./week Self-Learning Hours: 3 Hrs./week	**Credits: 3-0-0** 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	Core Java Programming
Objectives	• Students will be able to explain the basics of operating systems, Linux history, distributions, and the concept of open source. • Students will be able to install Linux using different methods and understand its file system, boot process, and desktop environments. • Students will be able to navigate the Linux file system, use basic commands, and manage users, groups, and file permissions. • Students will be able to monitor system processes, manage disk space, and write simple shell scripts using conditions and loops.
Course Outcomes	**CO1**: Understand operating systems, Linux history, distributions, and the concept of open source. **CO2**: Perform Linux installation, system setup, and navigate through both GUI and terminal interfaces. **CO3**: Execute file system operations, manage users, groups, permissions, and handle processes and storage. **CO4**: Develop and run basic shell scripts using variables, conditionals, and loops for task automation.
Unit-I	**Introduction:** Introduction to operating systems and types (Windows, Mac, Linux), History and evolution of Linux, Advantages of Linux. Linux distributions: Ubuntu, CentOS, Fedora, Debian.Concept of open source and GNU/Linux licensing, Applications of Linux **(07 Hrs)**
Unit-II	**Linux Installation and System Setup:** Methods of installation: VirtualBox, live USB, dual-boot. Understanding the Linux boot process: BIOS GRUB Kernel . Partitioning and file systems: ext3, ext4, swap. Desktop environments: GNOME, XFCE. Creating a user during installation. Navigating through graphical interface and terminal. **(07 Hrs)**
Unit-III	**File System Navigation and Basic Commands**: Linux directory structure: /home, /etc, /bin, /usr, /var, /tmp, /root.File handling commands: pwd, cd, ls, mkdir, rmdir, touch, rm, cp, mv.Viewing file content: cat, less, more, head, tail Using wildcards ,Hidden files and viewing file properties: ls -a, stat.Getting help: man, --help **(07 Hrs)**

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Unit-IV	**Users, Groups, and File Permissions:** Types of users: root, standard, and system users Creating and deleting users: useradd, userdel, passwd.Group management: groupadd, usermod, id. Understanding file permissions: read, write, execute Viewing and changing permissions: ls -l, chmod, chown, chgrp.Ownership and security implications **(06 Hrs)**
Unit-V	**Process and Disk Management** : Understanding system processes.Viewing and managing processes: ps, top, kill, nice.Background and foreground processes: jobs, fg, bg, & Checking disk space and usage: df, du.Monitoring memory usage: free, uptime Mounting and unmounting USB drives: mount, umount **(06 Hrs)**
Unit-VI	**Basic Shell Scripting** : What is a shell and shell script? Writing a basic shell script using .sh files. Running a script: bash script.sh, ./script.sh. Using variables, echo, read for user input. Conditional statements: if, else, elif. Loops: for loop, while loop **(06 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Linux: The Complete Reference	Richard Petersen	McGraw-Hill Education	6th Edition
2.	UNIX and Linux System Administration Handbook	Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, Dan Mackin	Pearson Education	5th Edition
3.	Introduction to Linux: A Hands-on Guide	Machtelt Garrels	Fultus Corporation	1st Edition
4.	Linux Command Line and Shell Scripting Bible	Richard Blum, Christine Bresnahan	Wiley	3rd Edition
5.	Linux Pocket Guide	Daniel J. Barrett	O'Reilly Media	3rd Edition
6.	How Linux Works: What Every Superuser Should Know	Brian Ward	Starch Press	2nd Edition

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3				2				2		2
CO2	3	2	2		3					2	2
CO3	3	2			3			2	2		2
CO4	3	2	2	2	3			2	2	2	
Average	**3**	**2**	**2**	**2**	**3**	–	–	**2**	**2**	**2**	**2**
Mapping Strength	**3**	**2**	**2**	**2**	**3**	–	–	**2**	**2**	**2**	**2**

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Multidisciplinary Minor Vertical- Computer Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Computer Engineering) (Semester V)	
Course Category: MDM Course Code: **CSE336** **Course: Linux Operating System Laboratory** Teaching Scheme: Practical: 02 Hrs/Week	**Credits: 0-0-1** Teacher Assessment: 25 Marks
Objectives	• Students will be able to understand the basics of the Linux operating system and how to use its commands. • Students will be able to use Linux for managing files, writing basic shell scripts, managing users, and performing simple networking tasks.
Course Outcomes	**CO1**: Use Linux commands to manage files, directories, users, and permissions **CO2:** Write shell scripts to automate tasks and manage system processes.
List of Practical	1. To install Linux (Ubuntu) and explore the graphical and terminal interfaces. 2. To create, navigate, and manage files and directories using CLI. 3. To view and edit files using commands like cat, nano, less, etc. 4. To understand and modify file permissions using chmod, chown. 5. To create and manage users and groups in Linux. 6. To write a shell script that displays date, username, and working directory. 7. To automate tasks using if, for, and while constructs in scripts. 8. To monitor and manage processes, memory, and disk usage. 9. To install, update, and remove packages using apt.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	1	3	1	1	1	2	1	2
CO2	3	3	3	2	3	2	1	2	2	2	--
Average	**3**	**2**	**2**	**2**	**3**	**2**	**1**	**2**	**2**	**2**	**2**
Mapping Strength	**3**	**2**	**2**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**

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Multidisciplinary Minor Vertical- Computer Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Computer Engineering) (Semester VI)	
Course Category: **MDM** Course Code: **CSE361** Course: **Computer Network and Security** Teaching Scheme: Theory- 3 Hrs./week Self-Learning Hours: 3 Hrs./week	**Credits: 3-0-0** Mid Semester Examination-I: 15 Marks Mid Semester Examination-II:15 Marks Continuous In-semester Evaluation: 10 marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Prerequisite	Basic understanding of computer fundamentals, Operating System
Course Objectives	1. To understand the fundamental concepts, structures, and models of computer networks. 2. To explain the working of network protocols, addressing, and routing techniques. 3. To apply communication protocols and basic security practices in networking.
Course Outcomes	**CO1:** Explain the basic concepts of computer networks, types, topologies, and models **CO2:** Explain the working of data link and network layer protocols, including addressing and routing techniques. **CO3:** Apply transport and application layer protocols in simple client-server communication scenarios. **CO4:** Identify common network security threats and apply simple security practices.
Unit 1	**Introduction to Computer Networks** Definition, goals, and practical applications of networks, Types of networks: LAN, MAN, WAN, Network topologies: Bus, Ring, Star, Mesh, Hybrid, Basics of data communication: signals, transmission, media, Overview of OSI and TCP/IP Models. **(06 Hrs)**
Unit 2	**Data Link Layer** Main design issues: framing, error control, flow control, Error detection and correction, Basics of Medium Access Control: ALOHA, CSMA/CD, Introduction to Ethernet and Wireless LANs (802.11). **(06 Hrs.)**
Unit 3	**Network Layer** Design issues and services, Introduction to IP addressing (IPv4, IPv6), subletting, Concepts of Routing algorithms: Distance Vector, Link State, Comparison: IPv4 vs. IPv6,Basics of packet switching and delivery. **(07 Hrs.)**
Unit 4	**Transport Layer** Transport layer functions and overview, Basics of TCP and UDP protocol ,Principles of congestion and flow control, Simple explanation of connection establishment, Introduction to Quality of Service (QoS). **(07 Hrs.)**

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Unit 5	**Application Layer and Protocols** Application layer protocols: DNS, SMTP, FTP, HTTP, SNMP (basics), Understanding client-server architecture, Socket programming basics, Introduction to web and email communication. **(07 Hrs.)**
Unit 6	**Network Security** Security goals: Confidentiality, Integrity, Availability, Introduction to cryptography: symmetric (AES, DES), asymmetric (RSA),Simple authentication and digital signatures, certificates, Firewalls, VPNs, IDS/IPS ,Overview of threats (malware, phishing) and simple prevention tips. **(06 Hrs.)**

	Sr. No.	Title	Author	Publication	Edition
Text Books	T1	Data Communications and Networking	B. Forouzan	McGraw Hill	5th
	T2	Computer Networking: A Top-Down Approach	James F. Kurose, Keith W. Ross	Pearson Education	--
References	R1	Computer Networks	A Tanenbaum, N Feamster, D Wetherall	Pearson Education	5th
	R2.	Network Security Essentials: Applications and Standards	William Stallings	Pearson Education	6th
	R3	Introduction to Networking	Wendell Odom	Cisco Press	1st

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	1	–	–	–	–	2	–
CO2	3	3	2	2	2	–	–	–	–	2	–
CO3	3	3	3	2	3	–	–	–	–	2	–
CO4	3	2	2	2	2	1	1	–	–	2	–
Average	**3**	**2.5**	**2**	**1.75**	**2**	**1**	**1**	**–**	**–**	**2**	**–**
Mapping Strength	**3**	**3**	**2**	**2**	**2**	**1**	**1**	–	–	**2**	–

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Multidisciplinary Minor Vertical- Computer Engineering

Faculty of Science & Technology
Syllabus of Multidisciplinary Minor (Computer Engineering) (Semester VI)

Course Category: **MDM** Course Code: **CSE386** Course: **Computer Network and Security Laboratory** Teaching Scheme: Practical: 02 Hrs/Week	Credits: **0-0-1** Teacher Assessment: 25 Marks

Course Objectives	1. To understand the types of networks and devices used to establish communication. 2. To learn basic configurations and testing methods used to set up and secure networks.
Course Outcomes	CO1: Identify different types of networks and networking devices such as PCs, switches, routers, hubs, and explain their functions. CO2: Configure and test basic network setups including IP addressing, LAN topologies, firewall rules, and client-server communication using simulation tools
List of Practical's	1. Study of following Network Devices in Detail : Repeater, Hub, Switch, Bridge, Router, Gate Way 2. Identify different types of networks and networking devices (PCs, switches, routers, hubs). 3. Connect the computers in Local Area Network 4. Study of basic network command and Network configuration commands. 5. Design and test a basic LAN using Star or Bus topology 6. Assign IP addresses and testing connectivity with ping. 7. Configure a Network topology using packet tracer software 8. Implement a basic socket program showing client-server interaction using C/C++/Python 9. Observing and analyzing simple frames/packets using Wireshark. 10. Configuring and Testing Basic Firewall Rules in a Network Environment

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	1	–	–	–	–	2	–
CO2	3	3	3	2	3	1	–	–	–	2	–
Average	**3**	**2.5**	**2**	**1.5**	**2**	**1**	–	–	–	**2**	–
Mapping Strength	**3**	**3**	**3**	**2**	**3**	**1**	–	–	–	**2**	–

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Multidisciplinary Minor Vertical- Mechanical Engineering

(Offered by Department of Mechanical Engineering)

For other department/program students

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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	V	MED311	Energy Management	3	-	-	3	3
	2	V	MED336	Energy Management Lab	-	-	2	2	1
	3	VI	MED361	Metrology & Quality Control	3	-	-	3	3
	4	VI	MED386	Metrology & Quality Control Lab	-	-	2	2	1
	5	VII	MED411	Industrial Engineering	3	1	-	4	4
	6	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 V)	
Course Category: MDM Course Code: MED311 Course: **Energy Management** Teaching Scheme: Theory: 03 Hrs/week Self-Learning Hours: 3 Hrs./week	**Credits: 3-0-0** Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2.00 Hrs
Prerequisite	:- Basic understanding of Thermal , Electrical systems and Utilities
Course Objectives	1. Understand the global and Indian energy scenarios, energy policies, conservation needs, and environmental impacts. 2. Explain the principles of energy management and auditing, including objectives, types, and tools used. 3. Analyze the performance of thermal and electrical utilities to identify energy-saving opportunities. 4. Apply methods for energy performance assessment of various equipment and systems. 5. Evaluate energy projects using financial analysis techniques and understand the role of ESCOs. 6. Develop energy and material balances for industrial processes and promote sustainable energy practices.
Course Outcomes	CO1: Describe the global and national energy scenario, energy reserves, consumption trends, electricity pricing, and energy-related policies in India, including the Energy Conservation Act 2001. CO2: Explain the environmental impact of energy usage, international agreements on climate change, and the concept of sustainable development through energy efficiency practices. CO3: Interpret the objectives and methodology of energy audits and management, including instruments used, planning strategies, and monitoring tools such as EMIS. CO4: Analyze energy efficiency opportunities in thermal utilities like boilers, steam systems, insulation, and cogeneration through practical calculations and performance indicators. CO5: Evaluate electrical utility systems for energy savings, including power factor correction, motor efficiency, load management, lighting systems, and building energy codes. CO6: Perform energy performance assessments and basic financial evaluations (e.g., payback period, cash flow, risk analysis) to justify energy efficiency projects using case studies.
Unit-I	**General Aspects of Energy Audit and Management:** **Energy Scenario (Global and national)**: Energy reserves, Commercial Energy production and Energy Consumption, Electricity Pricing in India, Integrated Energy Policy. Energy Conservation and its Importance, Energy Conservation Act-2001 and related policies. **Energy Efficiency and Climate Change**: Global Environmental issues, International Agreements on climate change, The Kyoto protocol and CDM methodology, Sustainable development. **(7 Hrs)**

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Unit-II	**Energy Management and Audit**: Definition and Objectives of Energy management, Energy Audit Definition, Need, Types and approach. Instruments used for Energy Audit. **Energy Action planning**: Energy policy formulation, implementation strategies, and performance evaluation and management tools for effective execution. **Financial management**: Financial analysis methods, cash flow, sensitivity and risk analysis, and role of ESCOs. **Project Management**: Project development lifecycle: implementation planning, budgeting, procurement, construction and performance measurement. **Energy monitoring and targeting**: Key components, data sources, analysis methods and use of Energy Management Information Systems (EMIS). **(6 Hrs)**
Unit-III	**Energy Efficiency in Thermal Utilities:** **Boilers:** Energy Conservation Opportunities in Boiler. Steam System – Efficient Steam Utilization, Efficient Steam utilization and Energy Saving Opportunities. **Insulation and Refractories:** Calculation of Insulation thickness, Typical Refractories used in Industrial use. Cogeneration – Need, Principle and Merits of Cogeneration. Heat Exchangers – Concept of heat exchanger, Pinch analysis and technology. **(7 Hrs)**
Unit-IV	**Energy Efficiency in Electrical Utilities:** Introduction to Electric Power supply systems, Electricity Billing, Electrical Load management and maximum Demand Control, Power Factor Improvement and Benefits. Energy Efficient Motors, Efficient Operation of Compressed Air System, Lighting systems. Energy Conservation Building Code and Energy Efficiency measures in Buildings. **(8 Hrs)**
Unit-V	**Energy Performance Assessment for Equipment and Utility Systems:** Purpose of Performance test, Factors affecting Boiler performance, Direct and Indirect testing methods, Example – Boiler Efficiency Calculation, Performance assessment of Lighting System. **Material and Energy Balance:** Key components, principles, and development of material and energy balances-case study: pulp and paper industry. **(7 Hrs)**
Unit-VI	**Financial Analysis:** Fixed vs. variable costs, interest, simple payback, discounted cash flow methods and influencing factors. Includes basic numerical examples. **(5 Hrs)**

Text Book/ Reference Books

Sr. No.	Title	Author	Publication	Edition
1.	Guide Book for National Certification Examination for Energy Managers and Energy Auditors	Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India	Bureau of Energy Efficiency	-
2.	Energy Management Handbook	Stephen A Roosa, Steve Doty & Wayne Turner	River Publisher	9th
3.	Handbook on Energy Audits and Management	Abdul Ghafoor & Terry McGowan	Teri Press	-
4.	Energy Conservation and Management	S. C. Tripathy	Khanna Publishers	2024

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	3	2	-	1	2	2	2	2	-
CO2	2	3	2	-	-	3	2	-	1	1	2	2	2	-
CO3	2	3	2	2	3	2	1	-	1	2	2	2	3	1
CO4	3	3	3	3	3	2	-	-	-	2	2	2	3	1
CO5	3	3	3	2	3	2	-	-	-	2	2	2	2	1
CO6	2	3	3	2	2	2	-	-	2	3	3	3	2	2
AVG	2.5	2.83	2.6	2.25	2.75	2.33	1.66	-	1.25	2	2.16	2.16	2.33	1.25

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Multidisciplinary Minor Vertical- Mechanical Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Mechanical Engineering) (Semester V)		
Course Category: MDM Course Code: MED336 Course: **Energy Management Lab** **Teaching Scheme:** Practical: 2 Hrs/ week		**Credits: 0-0-1** Teachers Assessment: 25 Marks
Course Objectives	:	To enable students to identify energy wastage, analyze energy usage, and apply effective energy management techniques and policies to promote sustainable and efficient energy use in buildings and systems.
List of Practical/ Assignments	:	1. Identify at least 5 instances of energy wastage in daily life and suggest practical measures to reduce them. 2. Prepare a detailed note on Energy Management – its definition, objectives, need, and benefits. 3. Draft an Energy Policy for your College or Building outlining goals, actions, and implementation methods. 4. Measure the brightness (lux level) of a room and suggest ways to improve lighting efficiency using efficient fixtures or better layout. 5. Prepare a detailed report on Power Factor Improvement – causes of low power factor, methods to improve it, and its advantages. 6. Lists commonly used insulation materials in different applications and solve a numerical problem on calculating optimal insulation thickness. 7. Analyze an energy usage chart (real or dummy data) and recommend ways to reduce energy usage during peak hours. 8. Prepare a short report on a simple energy-saving idea (e.g., sensor-based lights, solar streetlights, or using daylight effectively).
(All are compulsory)		

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

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Multidisciplinary Minor Vertical- Mechanical Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Mechanical Engineering) (Semester VI)	
Course Category: MDM Course Code: MED361 Course: **Metrology & Quality Control** Teaching Scheme: Theory: 03 Hrs/week Self-Learning Hours: 3 Hrs./week	**Credits: 3-0-0** Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2.00 Hrs
Prerequisite	:-Students should know some fundamentals of measurement.
Course Objectives	1. Learn inspection of engineering parts with various precision instruments. 2. Understand principles of measuring instruments, gauges and their uses. 3. To comprehend the concepts such as total quality management, ISO, statistical quality control and acceptance sampling.
Course Outcomes	CO1: Recall the basics knowledge of metrology and measuring devices. CO2: Explain different linear and angular measuring precise instruments and apply the acquired knowledge for the accurate and precise measurement. CO3: Apply knowledge of various tools and techniques used to determine geometry and dimensions of components to produce quality products. CO4: Analyze the data of measurement for understanding the concept of quality and Statistical Quality Control. CO5: Examine the deviation and surface finish of the measured parts with measuring tools. CO6: Discuss the concept of Quality, principles of Statistical Quality Control, seven quality control tools and acceptance sampling.
Unit-I	**Introduction to Metrology:** Role of Legal Metrology-Physical characteristics of instruments. Errors in measurement and its types, Standards of Measurements, line and End Standard. Slip gauges - Interchangeability and selective assembly. Introduction to Comparator-Mechanical, Optical, Electrical Electronic, and Pneumatic Comparator. **(7 Hrs)**
Unit-II	**Limits, Fits and Gauges:** Introduction to Limits, Fits, classification & types of gauges, Taylor's principle, gauge design, and Tolerances & their types. Introduction to GO & NO-GO gauges. **Metrology of Screw Threads:** Terminology of screw threads, Different errors in screw threads, Pitch measurement, Measurement of thread diameters with standard wire. Best size wire - Two and three wire method. **(7 Hrs)**
Unit-III	**Surface Finish Measurement and Interferometry:** Surface topography definitions, Methods of Evaluation of Surface finish. Determination of RMS and CLA values, Grades of roughness and its specifications. **Interferometry:** Principle of light wave interference - Light sources - Types of Interferometers. Measurement of straightness, Flatness, Squareness, Parallelism. Numerical assessment of surface roughness. **(5 Hrs)**

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Unit-IV	**Concept of Quality:** Definition of Quality, Specification of quality, Cost of quality, seven QC tools. **Quality Standards**: Quality management principles of ISO-9000, implementation of ISO standards. **Statistical Quality Control Introduction**: Chance Causes and assignable Causes - SQC Benefits and Limitations. Normal distribution curve. **(7 Hrs)**
Unit-V	**Theory of Control Charts:** Control Charts for Variables - X bar and R charts, Process capability studies. Control Charts for attributes - Fraction defectives and number of defects. Numerical on control charts. **7 Hrs)**
Unit-VI	**Acceptance Sampling:** Introduction of acceptance sampling inspection. Methods of acceptance sampling. Operating Characteristics curve, Producer risk and Consumer risk, Acceptable Quality Level (AQL), Average Outgoing Quality Limit (AOQL). **(7 Hrs)**

Text Book/ Reference Books

Sr. No.	Title	Author	Publication	Edition
1.	Engineering Metrology	R.K. Jain	Khanna Publishers	20nd
2.	Engineering Metrology	K.J Hume	Macdonald Publications	-
3.	Statistical Quality Control & Quality Management	R.C Gupta	Khanna Publishers	10th
4.	Engineering Metrology and Measurements	Raghavendra & Krishnamurthy	Oxford	1st
5.	Introduction to Statistical Quality Control	Douglas C. Montgomery	John Wiley & Sons	6th

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-	-	1
CO3	2	3	3	-	-	-	-	-	-	-	-	-	-	3
CO4	2	2	3	-	-	-	-	-	-	-	-	-	-	3
CO5	2	2	1	3	-	-	-	-	-	-	-	-	-	1
CO6	2	-	-	3	-	-	-	-	-	-	-	-	-	-
AVG	**2**	**1.5**	**1.3**	**1**	-	-	-	-	-	-	-	-	-	**1.3**

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Multidisciplinary Minor Vertical- Mechanical Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Mechanical Engineering) (Semester VI)		
Course Category: MDM Course Code: MED386 Course: **Metrology & Quality Control Lab** Teaching Scheme: Practical: 2 Hrs/ week		**Credits: 0-0-1** Teachers Assessment: 25 Marks
Course Objectives	:	1. Selection of tools and techniques for determining geometry and dimensions. 2. Identification of errors and its need for calibration of equipment. 3. Application of Quality Control Techniques and use of quality control tools.
List of Practical/ Assignments	:	1. Determination of linear and angular dimensions in a measurement of components using precision measuring instruments. 2. Verification of dimensions & geometry of given components using comparators. 3. Determination of error in linear measuring instrument and showing need for calibration. 4. Determination of geometry & dimensions of given object using profile projector. 5. Measurement of various angles of single point cutting tool using Tool maker's microscope. 6. Measurement of thread parameters using floating carriage diameter measuring machine. 7. Measurement of spur gear parameters using gear tooth Vernier and gear rolling tester. 8. Identification of surfaces using optical flat/interferometers and measure surface roughness using surface roughness tester 9. Prepare a control chart for variable data. 10. Prepare a control chart for attribute data.
(Any 8 number of practical to be performed from the given list)		

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

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Multidisciplinary Minor Vertical- Civil Engineering

(Offered by Department of Civil Engineering)

For other department/program students

WEF AY 2025-26 (Third year B. Tech Onwards)

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	V	CED311	Smart Cities and Technologies	3	-	-	3	3
	2	V	CED336	Smart Cities and Technologies Lab	-	-	2	2	1
	3	VI	CED361	Software Application in Civil Engineering	3	-	-	3	3
	4	VI	CED386	Software Application in Civil Engineering Lab	-	-	2	2	1
	5	VII	CED411	Construction Management	3	1	-	4	4
	6	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 V)	
Course Category: MDM Course Code: **CED311** Course: Smart Cities and Technologies **Teaching Scheme**: Theory – 3 Hrs./week Self-Learning Hours: 3 Hrs./week	**Credits: 3-0-0** In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.
Prerequisite	Basic knowledge of **urban planning** or **civil infrastructure systems**
Objectives	**Introduce** the foundational concepts, key features, and global/national frameworks of smart city missions. **Explore** urban governance mechanisms, policies, institutional structures, and the role of citizen participation in smart city development.
Course Outcomes	**CO1.**Understand the fundamental concepts, features, and global/national initiatives related to smart cities. **CO2.**Analyze governance structures, policies, and the role of citizen participation in smart city planning and service delivery. **CO3.**Apply intelligent transportation, mobility solutions, and sustainable transit strategies to address urban mobility challenges. **CO4.**Evaluate smart energy, water, and environmental systems for their efficiency, sustainability, and integration in urban infrastructure. **CO5.**Examine waste management practices and technologies used in smart cities, including IoT-based logistics and processing systems. **CO6.**Design a basic smart city intervention or project plan integrating lifecycle management, risk mitigation, and resilience strategies.
Unit-I	**Smart City Overview & Frameworks**: Definitions & key features, global & Indian smart city missions, Urban planning challenges, smart infrastructure layers (transport, energy, water, ICT), Case studies Indian Smart Cities **(6 Hrs)**
Unit-II	**Governance, Policy & Citizen-Centric Smart Cities:** Roles of central, state, and local government in smart cities, e-Governance and integrated urban service delivery, Urban local bodies (ULBs), capacity building, and administrative reforms, Land use planning, building codes, zoning regulations, Role of citizen engagement in planning and implementation **(6 Hrs)**
Unit-III	**Smart Mobility & Transportation Systems**: Intelligent Transportation Systems (ITS), EV infrastructure, traffic signal control, AI in mobility planning, Sustainable mobility and transit integration, Overview of urban transport issues in Indian and global contexts, Traffic congestion, pollution, last-mile connectivity, and modal imbalances **(6 Hrs)**

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Unit-IV	**Energy, Water & Environmental Systems**: Smart grids, renewable integration, distributed energy, Smart water, smart drainage, Use of permeable pavements, green roofs for stormwater control,Recycling and reuse: greywater systems, decentralized treatment, Sludge management and energy recovery from wastewater. **(7Hrs)**
Unit-V	**Solid Waste Management in Smart Cities: Waste Collection, Segregation & Transport Logistics:** Door-to-door collection, routing optimization using GPS/IoT, Material Recovery Facilities (MRFs), and transfer stations ,**Processing Technologies:** Composting (anaerobic digestion, biogas), Refuse-Derived Fuel (RDF), waste-to-energy incineration, sanitary landfills **(7Hrs)**
Unit-VI	**Project Management & Disaster Response**: Project life-cycle management, WBS, CPM/PERT method, stakeholder engagement, PPPs, Smart disaster monitoring & warning systems, risk mitigation planning **(7Hrs)**

Text Books (T), Reference Books (R) and E-resources (E)

Sr. No.	Title	Author	Publication	Edition
T1.	Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia	Anthony Townsend	W. W. Norton & Co.	1st
T2.	Smart Cities: Foundations, Principles, and Applications	H. Vinod Bhat et al.	Wiley India	1st
T3.	Internet of Things: A Hands-on Approach	Arshdeep Bahga, Vijay Madisetti	Universities Press	1st
R1.	Intelligent Transport Systems	Asier Perallos et al.	Wiley	1st
R2.	Project Management for the Unofficial Project Manager	Kory Kogon et al.	Simon & Schuster	1st
R3.	The Age of Intelligent Cities	Nicos Komninos	Routledge	1st
R4.	Urban Infrastructure: Planning, Governance and Finance	G. Shabbir Cheema, Aslam Chaudhry	Sage	1st
E1	Exploring IoT in Smart Cities: Practices, Challenges and Way Forward	Ishaq et al.	arXiv.org	2023 Edition
E2	A Comprehensive Review of Smart Cities Based on IoT	Aslam & Ullah	arXiv.org	2020 Edition
E3	Smart Cities Mission: Guidelines & Toolkit	Ministry of Housing and Urban Affairs (GoI)	Government of India	Latest

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CO-PO mapping:

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

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Multidisciplinary Minor Vertical- Civil Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Civil Engineering) (Semester V)	
Course Category: **MDM** Course Code: **CED336** Course: **Smart Cities and Technologies Lab** Teaching Scheme: **Practical: 02 Hrs/Week**	**Credits: 0-0-1** Teaching Assessment: 25 Marks
Prerequisite	Basic knowledge of **urban planning** or **civil infrastructure systems**
Objectives	**Introduce** the foundational concepts, key features, and global/national frameworks of smart city missions. **Explore** urban governance mechanisms, policies, institutional structures, and the role of citizen participation in smart city development.
List of Practical	**List of Practical (Any Eight)** 1. Analyze two Indian smart cities based on core infrastructure, ICT deployment, and area-based development (ABD). 2. Write a policy brief on a selected governance topic (e.g., citizen participation, zoning, e-governance). 3. Identify stakeholders for a smart city project (e.g., smart mobility or solid waste) and create a stakeholder influence-interest matrix. 4. Survey and assess walkability, last-mile connectivity, and transport integration near a transit stop. 5. Prepare a conceptual layout and location plan for an EV charging station in a selected locality. 6. Propose a smart water system for a residential complex (with metering, monitoring, and leakage detection). 7. Conduct a basic energy audit to estimate energy usage and suggest smart solutions. 8. Use simple simulation or mapping tools (like Google Maps + Excel) to optimize waste collection routes. 9. Prepare a smart solution project proposal (e.g., smart bus stop, disaster alert system, smart park).

Course Outcomes (COs):

CO1: Analyse smart city case studies, governance mechanisms, and stakeholder dynamics using structured assessment tools.

CO2: Apply survey methods, simulation, and mapping tools to evaluate and improve urban mobility, water, waste, and energy systems.

CO3: Design conceptual plans and layouts for smart infrastructure interventions such as EV charging stations, smart water, or energy solutions.

CO4: Develop and present integrated smart city project proposals considering sustainability, resilience, and citizen-centric approaches.

CO-PO mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	3	1	-	2	3	2	1	2	1	1
CO2	3	3	2	2	3	3	-	-	-	-	2
CO3	3	2	3	2	3	3	1	1	2	2	2
CO4	2	2	3	2	2	3	2	2	3	3	2

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Multidisciplinary Minor Vertical- Civil Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Civil Engineering) (Semester VI)	
Course Category: MDM Course Code: **CED361** Course: **Software Application in Civil Engineering** Teaching Scheme: Theory – 3 Hrs./week Self-Learning Hours: 3 Hrs./week	**Credits: 3-0-0** In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.
Prere-quisite	• Fundamentals of Civil Engineering, Engineering Drawing, Elementary computer operation skills, Engineering Mathematics
Objectives	• To develop understanding of software tools used in civil engineering design, analysis, and planning. • To build hands-on skills in open-source and proprietary software like spreadsheets, CAD tools, GIS, and simulation platforms. • To demonstrate data modeling, visualization, and computational methods in practical civil engineering applications. • To create awareness about the limitations, validation, and interpretation of software outputs to avoid critical errors.
Course Outcomes	Students will be able to CO1: Understand the role, advantages, and limitations of software tools in civil engineering. CO2: Prepare quantity estimations, BOQ, and concrete mix designs using spreadsheet software. CO3: Draft basic civil engineering drawings using CAD and model them in 2D and 3D environments. CO4: Apply GIS techniques for land mapping, survey data analysis, and infrastructure planning. CO5: Simulate and analyze water distribution networks using EPANET and interpret the results.
Unit-I	Importance and need of software for modeling, analysis and design in Civil Engineering field, Advantages and limitations of software, causes for errors, validation of software results. Failures due to errors in modeling, data entry and interpretation of software results. **(6Hrs)**
Unit-II	**Introduction to Civil Engineering Software Tools** Categories: CAD, Structural Analysis, GIS, Project Management, Estimation, Modeling **Introduction to Open-Source Tools:** LibreCAD,FreeCAD,QCAD, AutoCAD, QGIS, GNU Octave, Spreadsheet,ProjectLibre, OpenProject, Scilab. **(6Hrs)**
Unit-III	**MS Excel/Spreadsheet Application for Estimation and Design** Interface, Commands, formulas, Operations, Basic data formatting, Table creation, Graphs, Quantity Estimation, Item-wise BOQ preparation, Rate Analysis, Design of Concrete Mix **(6Hrs)**

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Unit-IV	**CAD and Drafting Applications** AutoCAD/LibreCAD/FreeCAD basics, Commands, Operation, Drafting of floor plans, sections, elevations. Introduction to 3D modeling and BIM **(7 Hrs)**
Unit-V	**GIS Applications** Basic concepts of GIS: spatial data, raster vs vector data, georeferencing, Components of GIS: hardware, software, data, methods, and people.Role of GIS in civil engineeringOverview of modern surveying tools: total station, GPS, drones, mobile mapping. **(7Hrs)**
Unit-VI	Introduction to **QGIS** (open-sourceplatform). Types of data: shapefiles (.shp), raster files (.tif), CSV coordinates, Importing field survey data into QGIS, Use of **QField** for Android/mobile-based survey data collection, Integration of QField with QGIS (desktop), **(7Hrs)**

Text Books (T), Reference Books (R) and E-resources (E)

Sr. No.	Title	Author	Publication	Edition
T1.	Computer Applications in Civil Engineering	R. K. Anand	Vayu Education India	1st, 2013
T2.	Computer Aided Design in Civil Engineering	Satyanarayana N.V., S. Narayana	CRC Press	1st, 2018
T3.	Spreadsheet Applications in Engineering	Ronald W. Larsen	Pearson Education	3rd, 2016
R1.	GIS Fundamentals	Paul Bolstad	XanEdu Publishing	6th, 2019
R2.	Learning QGIS - A Practical Guide	Anita Graser	Packt Publishing	3rd, 2020
R3.	Computer Aided Estimating and Costing	B.S. Patil	University Science Press	1st ,2013
R4.	AutoCAD for Engineers	Sham Tickoo	CADCIM Technologies	23rd , 2023
E1	https://docs.qgis.org			
E2	https://docs.qfield.org			
E3	https://www.autodesk.com/learning			
E4	https://www.civilengineeringtutorials.com			

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CO-PO mapping:

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

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Multidisciplinary Minor Vertical- Civil Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Civil Engineering) (Semester VI)	
Course Category: MDM Course Code: **CED386** Course: **Software Application in Civil Engineering Lab** Teaching Scheme: Practical: 02 Hrs/Week	**Credits: 0-0-1** Teacher Assessment: 25 Marks

Prerequisite	Fundamentals of Civil Engineering, Engineering Drawing, Elementary computer operation skills, Engineering Mathematics
Objectives	1. To build hands-on skills in open-source and proprietary software like spreadsheets, CAD tools, GIS, and simulation platforms. 2. To develop understanding of software tools used in civil engineering design, analysis, and planning.
Course Outcomes (COs)	CO1: Develop 2D building drawings (plans, elevations, sections) using open-source and commercial CAD tools. CO2: Apply spreadsheet applications for cost estimation, rate analysis, and concrete mix design as per IS 10262. CO3: Use QGIS and QField tools for spatial data collection, digitization, and preparation of site/base maps. CO4: Generate contour maps and analyze terrain using DEM data in GIS environment.
List of Experiment	**Any Five activities of the following:** 1. Drafting a residential building plan in FreeCAD/AutoCAD/LibreCAD/QCAD. 2. Drafting a residential building Elevation and section in FreeCAD /AutoCAD /LibreCAD/ QCAD. 3. Spreadsheet-based cost estimation and rate analysis 4. Prepare a concrete mix design sheet as per IS 10262 using spreadsheet 5. Digitize a site plan using Google satellite imagery in QGIS. 6. Collect field data using QField mobile app and sync with QGIS for base map generation 7. Create Contour Map from DEM using QGIS

CO-PO mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	3	–	3		–				2
CO2	2	2	3	–	3		–				2
CO3	2	2	2	2	3		2				2
CO4	2	2	2	3	3		3				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 (Third year B. Tech Onwards)

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	V	ECE311	Embedded System Application	3	-	-	3	3
	2	V	ECE336	Embedded System Application Lab	-	-	2	2	1
	3	VI	ECE361	Communication Systems	3	-	-	3	3
	4	VI	ECE386	Communication Systems Lab	-	-	2	2	1
	5	VII	ECE411	Internet of Things	3	1	-	4	4
	6	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 V)	
Course Category: MDM Course Code:**ECE311** Course: **Embedded System Application** Teaching Scheme: Theory- 03 Hrs./week Self-Learning Hours: 3 Hrs./week	**Credits: 3-0-0** 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, Basic C Programming
Objectives	To introduce students to embedded systems design using 8051 and Arduino platforms, focusing on programming in Embedded C, peripheral interfacing, and practical applications in real-world systems.
Unit-I	**Introduction to Embedded System** Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems **(06 Hrs.)**
Unit-II	**Introduction to Architecture of 8051** Architecture of 8051, Features and pin diagram of 8051, Memory organization, Addressing Modes, Port structure, Interrupt structure, timers and its modes, serial communication and its modes **(07 Hrs.)**
Unit-III	**Embedded C Programming** Overview of Embedded C, Data Types, Operators and Control Structures, Functions, I/O Port Programming **(06 Hrs.)**
Unit-IV	**Peripheral Interfacing with Microcontrollers** LED interfacing to 8051, Interfacing of LCD, Keypad, Motors, IR and Switches, Both side serial communication (All programs in embedded C) **(06 Hrs.)**
Unit-V	**Introduction to Arduino:** Introduction of Arduino Boards, Features of Arduino UNO Board, Arduino Shields, Introduction to the Arduino IDE, installing the Arduino IDE and uploading a sketch to your Arduino, Introduction to Arduino programming, Understand the basic parts of an Arduino sketch, custom functions, creating functions, Using variables, constants, and control structures: The "if"," while", "For"," Switch" statement **(08 Hrs.)**

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Unit-VI	**Embedded System Application and Development** Case Study of Washing Machine, Automotive Application, Smart card System Application, ATM machine, Digital camera **(06 Hrs.)**

	Sr. No	Title	Author	Publication	Edition
Textbooks and Reference Books	01	The 8051 Microcontroller & Embedded Systems (Using Assembly and C)	Mahumad Ali Mazadi, Janice Gillispie Mazadi, Rolin D McKinlay	PHI	2nd Edition
	02	The 8051 Microcontroller,	Kenneth J. Ayala,	Cengage Learning	3rd edition
	03	Microcontrollers Theory and Applications	Ajay Deshmukh	TATA McGraw Hill,	4th Edition
	04	Embedded C	Michael J. Pont	Pearson Education	1st Edition
	05	Programming and Customizing the 8051 Microcontroller	Myke Predko	McGraw Hill	2nd Edition
	06	Exploring Arduino: Tools and Techniques for Engineering	Jeremy Blum	Wiley	2nd Edition
	07	Embedded Systems: Architecture, Programming and Design	Raj Kamal	McGraw Hill Education	3rd Edition
E-resources link	https://nptel.ac.in/courses/117104072				

Course Outcome

CO1	Understand the concept, classification, and purpose of embedded systems.
CO2	Describe the architecture and programming model of 8051 microcontroller.
CO3	Apply Embedded C and Arduino programming to implement peripheral interfacing.
CO4	Analyze and evaluate embedded applications for real-world case studies.

CO and PO Mapping

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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Multidisciplinary Minor Vertical- Electronics Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Electronics Engineering) (Semester V)	
Course Category: MDM Course Code: **ECE336** **Course: Embedded System Application Lab** Teaching Scheme: Practical: 02 Hrs/Week	**Credits: 0-0-1** Teacher Assessment: 25 Marks

Prerequisite	Students should be familiar with Digital Systems
Objectives	To introduce students to embedded systems design using 8051 and Arduino platforms, focusing on programming in Embedded C, peripheral interfacing, and practical applications in real-world systems.
List of Experiment (Minimum 10)	1. Write and execute an Embedded C program to blink an LED using 8051. 2. Interface a switch with 8051 and control an LED based on switch input. 3. Write Embedded C program to display text on a 16x2 LCD using 8051. 4. Interface a 4x4 matrix keypad with 8051 and display the key pressed. 5. Interface a DC motor using 8051 for clockwise and counterclockwise rotation. 6. Implement UART-based serial communication using 8051 and display received data. 7. Blink an LED using Arduino UNO with delay loop. 8. Interface a push button to toggle an LED using Arduino. 9. Display text on a 16x2 LCD using Arduino UNO. 10. Interface an IR sensor with Arduino and indicate obstacle using LED. 11. Interface a DC motor with Arduino and control its direction and speed. 12. Implement serial communication using Arduino to send/receive data from PC. Note: Perform any 10 lab experiments
Lab Equipment	Breadboards, Jumper Wires (Male-Male, Male-Female), USB Cables (Type-A to B for Arduino), Power Supply (5V DC regulated), Multimeters (Digital), Soldering Kit (optional, for permanent setups), Computer systems with: Keil µVision IDE, Flash Magic, Arduino IDE, USB-to-Serial Drivers installed

Course Outcome

CO1	Apply Embedded C programming skills to implement basic embedded system applications using 8051 and Arduino platforms.
CO2	Design and demonstrate real-time embedded applications by interfacing sensors, actuators, and communication modules with microcontrollers.

CO and PO Mapping

CO	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								

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Multidisciplinary Minor Vertical- Electronics Engineering

Faculty of Science and Technology Syllabus of Multidisciplinary Minor (Electronics Engineering) (Semester VI)	
Course Category: MDM Course Code: **ECE361** **Course: Communication Systems** Teaching Scheme: Theory- 03 Hrs./week Self-Learning Hours: 3 Hrs./week	**Credits: 3-0-0** 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	Analog and Digital Signals, Frequency, Frequency Spectrum
Objectives	To introduce to students, modern communication systems To understand the fundamental principles of signal transmission and receiver
Unit-I	**Introduction to Communication Systems:** Block schematic of Communication systems, Elements of Communication System, Frequency Spectrum, Types of communication systems, need for modulation, Types of modulations, Amplitude Modulation, Angle Modulation, Pulse Modulation, AM Receiver, FM Receiver (06 Hrs.)
Unit-II	**Introduction to Optical Fiber Communication:** Overview, Optical laws, optical modes and configurations, fiber materials, fiber fabrication techniques, classification of optical fiber-Single mode and graded index fiber, Optical sources and detectors, block diagram, optical couplers and connectors, optical communication losses (06 Hrs.)
Unit-III	**Introduction to Wireless Mobile Communication:** History and evolution of mobile communication systems, Types of mobile wireless services/ systems-Cellular, WLL, Paging, Satellite systems, Cellular concept, Frequency Reuse, Channel assignment and handoff, Mobile radio propagation-Multipath fading, Antenna systems, FDMA, TDMA, CDMA concepts, GSM Architecture (06 Hrs.)
Unit-IV	**Introduction to RADAR Communication:** Introduction to RADAR, RADAR range equation, Block diagram, Working principle, RADAR frequencies and waveforms, RADAR components, RADAR Types, Applications (06 Hrs.)
Unit-V	**Introduction to Satellite Communication:** Satellite Systems, Satellite frequency band, Orbit, Orbital Period and Velocity, Link Equation, Azimuth and Elevation, Eclipse, Satellite Subsystems, Types of Satellites and types of orbits, Placement of Satellite in Geostationary Orbit, Earth Station, Global Positioning System, Applications (06 Hrs.)
Unit-VI	**Introduction to Computer Networks:** Network and Communication, Network Criteria, Network Categories- LAN, MAN, WAN their applications, Topologies, Issues in network and communication, Advantages, Disadvantages, Applications (06 Hrs.)

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	Sr. No	Title	Author	Publication	Edition
Textbooks and Reference Books	01	Electronics and Communication Systems	George Kennedy and Bernard Devis	McGraw Hill Eduction	2004
	02	Wireless Digital Communication	K. Feher	PHI	1995
	03	Fundamental of Satellite Communication	K. N. Raja Rao	PHI	2004
	04	Optical Fibre Communication	Gerd Keiser	MGH	Forth, 2008
	05	Principles of Communication Systems	Taub Schilling	Tata McGraw Hill	4th Edition
	06	Satellite Communication	Dennis Roddy	McGraw Hill	2nd, 1996
	07	Wireless Communication: Principles and Practice	T. S. Rappaport	Prentice Hall, NJ	1996
	08	Computer Networks	Andrew S. Tanenbaum and David J. Wetherall	Prentice Hall, NJ	Fifth
	09	Optical Fibre Communications	John M. Senior	Pearson Education	Third Impression, 2007
E-resources link		https://sathee.iitk.ac.in/article/physics/communication-systems/ https://www.elprocus.com/basic-elements-of-fiber-optic-communication-system-and-its-working/ https://mrcet.com/downloads/digital_notes/ECE/III%20Year/FIBER%20OPTICAL%20COMMUNICATIONS.pdf https://www.ntiprit.gov.in/pdf/gsm2g/GSM_Architecture.pdf https://www.radartutorial.eu/02.basics/!rp02.en.html https://www.furuno.com/en/technology/radar/basic/ https://www.intelsat.com/resources/tools/satellite-101/ https://www.vssut.ac.in/lecture_notes/lecture1423905560.pdf			

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Course Outcome

CO1	Explain the principles of light transmission in optical fibres. (Understanding level)
CO2	Describe the principles of signal transmission in RADAR and Satellite systems. (Understanding level)
CO3	Classify signal communication methods via cable and wireless media. (Analyzing level)
CO4	Illustrate the working of Computer Networks. (Applying/Understanding level)

CO and PO Mapping

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

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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Multidisciplinary Minor Vertical- Electronics Engineering

Faculty of Science and Technology Syllabus of Multidisciplinary Minor (Electronics Engineering) (Semester VI)	
Course Category: MDM Course Code: **ECE386** Course: **Communication Systems Lab** Teaching Scheme: Practical: 02 Hrs./Week	**Credits: 0-0-1** Teacher Assessment: 25 Marks

Prerequisite	Basic Knowledge of Analog Communication
Objectives	Analyze techniques of modulation and multiplexing in telecommunications. Gain practical knowledge of fiber optic communication systems and mobile phone circuitry.
List of Experiment (Minimum 10)	1. Verification of Sampling Theorem 2. Perform Time Division Multiplexing 3. Perform Frequency Division Multiplexing 4. Study of Fiber Optic Cables 5. Study of Fiber Optic Communication (Analog Link) 6. Study of Fiber Optic Communication (Digital Link) 7. To understand the Basic circuit of Mobile phone (Transmitter, Receiver and Base band control Section 8. To study working of a SIM card in 4G LTE handset, SIM card detection. 9. To study working of satellite by establishing a link between satellite and earth station. 10. To study working of RADAR.
List of Lab Equipment required for the practical	CRO, Function Generator, Power Supply, Kits

Course Outcome

CO1	Analyze and implement various modulation and multiplexing techniques and their application in modern communication systems.
CO2	Demonstrate proficiency in designing and troubleshooting basic circuits of mobile phones and FOC

CO and PO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	1				1						
CO2	1				1						

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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Multidisciplinary Minor Vertical- Electrical Engineering

(Offered by Department of Electrical Engineering)

For other department/program students

WEF AY 2025-26 (Third year B. Tech Onwards)

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	V	EED311	Transmission and Distribution of Electrical Power	3	-	-	3	3
	2	V	EED336	Transmission and Distribution of Electrical Power Lab	-	-	2	2	1
	3	VI	EED361	Testing and Maintenance of Electrical Equipment	3	-	-	3	3
	4	VI	EED386	Testing and Maintenance of Electrical Equipment Lab	-	-	2	2	1
	5	VII	EED411	Fundamentals of Rooftop Solar System Design	3	1	-	4	4
	6	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 V)	
Course Category: MDM Course Code: **EED311** Course: **Transmission and Distribution of Electrical Power** Teaching Scheme: Theory- 3 Hrs./week Self-Learning Hours: 3 Hrs./week	**Credits: 3-0-0** 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 Power System Modelling, Load flow Analysis to find solution of problems in power system networks. 2. To understand and apply the concept of symmetrical components for finding out the solution of Unsymmetrical faults. 3. To analyze Symmetrical Faults and study Electrical Power Quality.
Unit-I	**Electrical Power Generation**: Evolution of Power Systems, Typical Layout of an Electrical Power System, Construction and working of thermal power plants, Hydro power station, Nuclear Power Plant. **(06 Hrs.)**
Unit-II	**Electrical Design of Overhead Transmission Lines** - Types of conductors, basic concept of inductance and capacitance (1-phase & 3-phase), introduction of GMD and GMR, composite conductors, bundled conductors and idea of transposition, skin effect, proximity effect. **(06 Hrs.)**
Unit-III	**Mechanical Design of Transmission Lines** - Selection of conductor type, basics of insulators, voltage distribution across insulators, environmental effects like wind and ice on transmission lines, concept of sag. **(06 Hrs.)**
Unit-IV	**Performance of Transmission Lines** - Classification of overhead transmission lines, performance of single-phase short transmission lines, three phase short transmission lines, effect of load power factor on regulation and efficiency. **(07 Hrs.)**
Unit-V	**AC Distribution** - Classification of Distribution system, Requirement of Distribution system, Design consideration in AC distribution system. **(07 Hrs.)**
Unit-VI	**DC Distribution** - Types of DC Distribution, DC Distribution calculation, three wire DC system. **(07 Hrs.)**

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	Sr. No.	Title	Author	Publication	Edition
Textbooks and Reference Books	1.	Modern System Analysis	I.J. Nagrath& D.P. Kothari	Tata McGraw-Hill	Fourth Edition
	2.	Electrical Power System	Ashfaque hussain	Dhanpat Rai & Co.	5th
	3.	Elements Power System	Wadhawa C.L	John Wiley & sons	6th
	4.	Power System analysis	Hadi Saadat	McGraw-Hill	4th
	5.	Elements of Power System Analysis	Stevenson W.D	McGraw-Hill	5th

Course Outcomes:

CO1	Describe the evolution and layout of electrical power systems and explain the working of various po plants such as thermal, hydro, and nuclear.
CO2	Interpret the electrical design aspects of overhead transmission lines including conductor types, inductance, capacitance, GMD/GMR, and effects such as corona, skin, and proximity effect.
CO3	Analyze the mechanical components of transmission lines including insulators, environmental effect and sag calculation.
CO4	Examine the performance of transmission lines under different load conditions and determine voltag regulation and efficiency.
CO5	Explain the classification, requirements, and design considerations in AC distribution systems.
CO6	Calculate voltage and current in DC distribution networks including two-wire and three-wire systems.

CO-PO Mapping:

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

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Multidisciplinary Minor Vertical- Electrical Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Electrical Engineering) (Semester V)	
Course Category: MDM Course Code: **EED336** Course: **Transmission and Distribution of Electrical Power Lab** Teaching Scheme: 02 Hrs./Week	**Credits: 0-0-1** Teacher Assessment: 25 Marks.
Prerequisite	Basic knowledge of electrical circuits, power system fundamentals, phasor analysis, and safety procedures.
Objectives	1. To study the structure, operation, and classification of power generation and AC/DC transmission-distribution systems. 2. To analyze electrical and mechanical parameters of transmission lines under various load and environmental conditions. 3. To evaluate transmission line performance and solve distribution system problems through calculations and simulations.
List of Experiment	1.Study of Thermal, Hydro, and Nuclear Power Plants using Block Diagrams 2.Calculation of Inductance and Capacitance for Overhead Transmission Lines 3.Voltage Distribution and String Efficiency in Suspension Insulator Strings 4.Determination of Sag in Overhead Transmission Lines 5.Performance Analysis of Short, Medium, and Long Transmission Lines 6.Simulation of Ferranti Effect in Long Transmission Lines 7.Corona Discharge Demonstration and Analysis of Corona Loss 8.Voltage Drop Calculation in AC Distribution Systems 9.Analysis of DC Two-Wire and Three-Wire Distribution Systems 10.Modeling and Simulation of Radial vs. Ring Distribution Networks

Course Outcomes:

CO1	Understand the construction, working, and layout of various power generation systems and analyze electrical and mechanical parameters of transmission lines.
CO2	Analyze and evaluate the performance of transmission and distribution under various operating conditions.

CO-PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2									
CO2	3	2	2	3	3						
Average	**3**	**2**	**2**	**3**	**3**						

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Multidisciplinary Minor Vertical- Electrical Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Electrical Engineering) (Semester VI)	
Course Category: MDM Course Code: **EED361** **Course: Testing and Maintenance of Electrical Equipment** Teaching Scheme: Theory-3 Hrs./week Self-Learning Hours: 3 Hrs./week	**Credits: 3-0-0** 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 Electrical Engineering and Electrical Measurement & Instrumentation.
Objectives	1.To introduce students to fundamental electrical equipment, safety protocols, and the importance of preventive and predictive maintenance in industrial environments. 2.To develop practical skills in using basic electrical testing instruments and interpreting measurements for fault diagnosis and equipment health assessment. 3.To enable students to understand and apply standard procedures for testing and maintaining transformers, motors, switchgear, and earthing systems to ensure safe and reliable operation.
Unit-I	**Introduction to Electrical Equipment and Safety Practices -** Importance of testing and maintenance in industry, Overview of electrical equipment: Motors, Transformers, Cables, Switchgear, Electrical hazards: Shock, arc flash, fire, Personal Protective Equipment (PPE), First Aid, and safety signage, Lock-out/Tag-out (LOTO) procedures. **(07 Hrs.)**
Unit-II	**Testing Instruments and Measuring Techniques -** Introduction to measuring instruments: Multimeter, Megger, Clamp meter, Earth tester**,** Voltage, current, resistance, insulation resistance, earth resistance measurement, Interpretation of test results, Calibration basics and safety during testing, trouble shooting of and maintenance of fan, refrigerator, water pump, washing machine (limited to electrical faults). **(08 Hrs.)**
Unit-III	**Maintenance of Transformers and Switchgear -** Transformer types: Dry-type, oil-immersed, Routine maintenance checklist for transformers, Testing: Insulation resistance, turns ratio, oil testing, Maintenance of MCB, MCCB, contactors, relays, and fuses. **(06 Hrs.)**
Unit-IV	**Testing and Maintenance of Electric Motors -** Motor types: Single-phase, three-phase induction motors, Insulation resistance, winding resistance, vibration, and temperature checks, Bearing maintenance, alignment, and lubrication, Common motor faults and their diagnosis. **(06 Hrs.)**
Unit-V	**Earthing and Lightning Protection Systems-** importance of earthing in safety, Types of earthing: Plate, pipe, chemical, Earth resistance measurement procedure, Overview of lightning arresters and surge protection devices. **(06 Hrs.)**
Unit-VI	**Preventive and Predictive Maintenance Techniques -** Difference between preventive and predictive maintenance, Thermography, vibration analysis, and ultrasonic testing (basic idea), Maintenance planning and documentation, Maintenance scheduling using checklists. **(6 Hrs.)**

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	Sr. No.	Title	Author	Publication	Edition
Textbooks and Reference Books	1	Testing, Commissioning, Operation and Maintenance of Electrical Equipment	S. Rao	Khanna Publishers	6th
	2	Electrical Equipment: Testing and Maintenance	B.V.S. Rao	Media Promoters & Publishers	1st
	3	Electrical Power Equipment Maintenance and Testing	Paul Gill	CRC Press / Taylor & Francis	2nd
	4	A Handbook on Operation and Maintenance of Transformers	H. N. S. Gowda	Indian Tech Publishers	1st
	5	Electrical Safety: A Practical Guide	Martha J. Boss & Gayle Nicoll	Wiley-Interscience	2nd

Course Outcomes:

CO	Statement
CO1	Identify the importance of electrical equipment testing and safety practices in industrial environments.
CO2	Demonstrate the ability to use basic electrical measuring instruments for testing and fault diagnosis.
CO3	Carry out basic maintenance procedures for transformers, motors, switchgear, and earthing systems.
CO4	Understand preventive and predictive maintenance strategies used in industry.
CO5	Apply safety procedures and documentation techniques during electrical equipment inspection and maintenance.
CO6	Interpret test results and suggest appropriate maintenance actions to enhance system reliability.

CO PO Mapping:

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

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Multidisciplinary Minor Vertical- Electrical Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Electrical Engineering) (Semester VI)	
Course Category: MDM Course Code: **EED386** Course: **Testing and Maintenance of Electrical Equipment Lab** Teaching Scheme: Practical 2 Hrs./week	**Credits: 0-0-1** Teacher Assessment: 25 Marks

Prerequisite	
List of Experiments	Minimum 10 experiments from the list given below: 1. To identify and understand the function of common electrical equipment such as transformers, motors, cables, and switchgear. 2. To measure voltage, current, and resistance in electrical circuits using a digital multimeter. 3. To test the insulation resistance of electrical cables or motor windings using an insulation tester (Megger). 4. To measure the earth resistance of an earthing system using an earth resistance tester. 5. To test the performance of a ceiling or table fan and identify common mechanical and electrical faults affecting its operation. 6. To perform functional testing of a refrigerator and measure its power consumption using a portable energy meter. 7. To assess the condition of a transformer by performing insulation resistance and turns ratio tests. 8. To conduct basic testing on an electric motor including no-load operation, winding resistance measurement. 9. To perform visual inspection and preventive maintenance on low-voltage switchgear components. 10. To observe the breakdown voltage test on transformer oil and assess its dielectric strength. 11. To study and demonstrate the proper use of personal protective equipment (PPE) during electrical maintenance. 12. To prepare a preventive maintenance schedule and checklist for a typical electrical panel.

Course Outcomes:

CO	Statement
CO1	Identify and use basic electrical testing instruments to perform equipment testing.
CO2	Demonstrate the ability to test, operate, and analyze the performance of common electrical appliances and industrial equipment.

CO PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	1	3							1
CO2	2	1		3		1					2

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Multidisciplinary Minor Vertical- Agricultural Engineering

(Offered by Department of Agricultural Engineering)

For other department/program students

WEF AY 2025-26 (Third year B. Tech Onwards)

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	V	AED311	Introduction to Agrotech and Sustainability	3	-	-	3	3
	2	V	AED336	Agri-Data Analysis Lab	-	-	2	2	1
	3	VI	AED361	IoT and Automation in Agriculture	3	-	-	3	3
	4	VI	AED386	Sensor & Drone Application Lab	-	-	2	2	1
	5	VII	AED411	Remote Sensing and GIS	3	1	-	4	4
	6	VII	AED436	Minor Project	-	-	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 V)	
Course Category: MDM Course Code: **MDM331** Course: **Introduction to Agrotech and Sustainability** Teaching Scheme: Theory- 3 Hrs./week Self-Learning Hours: 3 Hrs./week	**Credits: 3-0-0** In- Semester Examination-I: 15 Marks In- Semester Examination-II: 15Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs
Prerequisite	Basic knowledge of agriculture, environmental science, and sustainable development concepts.
Objectives	1. To introduce students to modern agricultural technologies and their role in sustainable development. 2. To promote understanding of ecological, economic, and social sustainability in Agri-tech applications.
Course Outcome	CO1: Explain the fundamentals of agrotech and its interdisciplinary nature. CO2: Evaluate the role of technological innovations in enhancing agricultural productivity. CO3: Interpret the concepts of sustainability in farming systems. CO4: Identify and analyze smart and digital agricultural tools. CO5: Assess the environmental and socio-economic impacts of agrotech solutions. CO6: Propose sustainable practices for resource-efficient agriculture.
Unit-I	**Fundamentals of Agrotech and Sustainability**:Definition, evolution, and scope of agrotech; Principles of sustainability; Dimensions of sustainable agriculture – environmental, social, and economic; Role of agrotech in global food security. **(6 Hrs.)**
Unit-II	**Smart and Precision Farming Technologies**:Concepts of smart farming; Tools and techniques: sensors, GPS, IoT, UAVs (drones), robotics, AI/ML in agriculture; Precision agriculture practices and benefits. **(6 Hrs.)**
Unit-III	**Renewable Energy and Resource Efficiency** :Use of solar, wind, biomass, and biogas in agriculture; Water use efficiency and energy conservation; Climate-smart agriculture; Carbon footprint and mitigation techniques.**(6 Hrs.)**
Unit-IV	**Digital Agriculture and ICT in Agrotech**:Role of ICT and mobile apps in agriculture; Data-driven farming; GIS, remote sensing, and decision support systems; Government schemes and digital platforms.**(6 Hrs.)**
Unit-V	**Sustainable Input Management**: Organic farming, biofertilizers, biopesticides; Agroecology and natural farming practices; Soil health management; Waste recycling and circular economy in agriculture. **(6 Hrs.)**

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Unit-VI	**Policy, Ethics, and Case Studies in Agrotech:** Agrotech-related policies and global initiatives (FAO, SDGs, FPOs); Ethical concerns, technology access, and rural inclusion; Case studies on successful sustainable agrotech models in India and abroad. **(6 Hrs.)**

	Sr. No.	Title	Author	Publication	Edition
Textbooks (T), Reference Books (R), and E-Sources	**T1**	Organic Farming – Theory & Practice	S.P. Palaniappan, K. Annadurai	Scientific Publishers	2019
	T2	Sustainable Agriculture	R. Roy	Oxford Book Company	2020
	T3	Introduction to Precision Agriculture	B. Bhattacharya	Indian Publishers Distributors	2019
	R1	Soil-Specific Farming: Precision Agriculture	R. Lal, B.A. Stewart	CRC Press	2015
	R2	Smart Agriculture: An Introduction	Satish Shah	New India Publishing Agency	2021
	R3	Digital Agriculture Report: Rural Transformation through Agri-Tech Innovation	FAO	Food and Agriculture Organization	2021
	E	https://www.mgu.ac.in/mooc-on-organic-farming/			

Course Outcomes (COs)

CO1: Explain the fundamentals of agrotech and its interdisciplinary nature. (Level: Understanding)
CO2: Evaluate the role of technological innovations in enhancing agricultural productivity. (Level: Evaluating)
CO3: Interpret the concepts of sustainability in farming systems. (Level: Understanding)
CO4: Identify and analyze smart and digital agricultural tools. (Level: Analyzing)
CO5: Assess the environmental and socio-economic impacts of agrotech solutions. (Level: Evaluating)
CO6: Propose sustainable practices for resource-efficient agriculture. (Level: Creating)

CO-PO Mapping Matrix

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1	0	0	2	1	0	2	
CO2	2	3	3	2	2	1	1	3	1	0	3	
CO3	3	2	2	1	1	1	0	2	1	1	3	
CO4	1	3	3	3	2	2	2	3	2	1	3	
CO5	2	3	2	3	3	2	2	3	2	1	3	
CO6	1	2	2	3	3	3	3	3	3	2	3	

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Multidisciplinary Minor Vertical- Agricultural Engineering

Faculty of Science & Technology Syllabus of Third Year B.Tech. (Agricultural Engineering) (Semester V)	
Course Category: MDM Course Code: **AED 336** Course: **Agri-Data Analysis Laboratory** Teaching Scheme: Practical: 02 Hrs/Week	**Credits: 0-0-1** Teacher Assessment: 25 Marks
Prerequisite	Basic knowledge of mathematics, MS Excel, and concepts of statistical data representation.
Objectives	1. To provide hands-on experience in applying statistical methods to agricultural data using manual calculations and software tools. 2. To develop skills for designing experiments, conducting data analysis, and interpreting results for effective decision-making in agriculture.
List of Experiments	1. Introduction to data types, classification, tabulation, and preparation of frequency tables 2. Graphical representation of data using bar charts, histograms, pie charts, and ogives 3. Computation of measures of central tendency (mean, median, mode) from agricultural data 4. Computation of dispersion measures (range, standard deviation, variance, CV) 5. Solving probability problems using theoretical distribution methods 6. Application of binomial, Poisson, and normal distributions in agricultural data analysis 7. Conducting simple random and stratified sampling from field data 8. Performing t-test, z-test, and chi-square test using sample agricultural data 9. Correlation analysis and calculation of Pearson's and Spearman's correlation coefficients 10. Regression analysis (simple and multiple) and interpretation of coefficients and R^2 value 11. Analysis of variance (ANOVA) for CRD, RBD, and LSD using real or simulated agricultural data 12. Introduction to statistical software (Excel/SPSS/R): Data entry, descriptive statistics, regression, and ANOVA
	Note: 1. **A minimumof 10 experiments** must be performed by each student from the list provided in the syllabus. 2. **The laboratory record book** must be maintained and submitted regularly for assessment.

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Course Outcomes (COs) and CO-PO Mapping

Course Outcomes (COs)

CO1: Apply appropriate statistical methods and techniques for analyzing agricultural data manually and using software tools. (Level: Applying)

CO2: Interpret the results of hypothesis testing, correlation, regression, and ANOVA for effective decision-making in agriculture. (Level: Analyzing)

CO-PO Mapping Matrix

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	1	1	1	0	2	1	0	2	
CO2	1	2	3	2	2	2	1	3	2	1	3	

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Multidisciplinary Minor Vertical- Agricultural Engineering

Faculty of Science & Technology Syllabus of Third Year B. Tech (Agricultural Engineering) (Semester VI)	
Course Category: MDM Course Code: **MDM361** Course: **IOT and Automation in Agriculture** Teaching Scheme: Theory- 3 Hrs./week Self-Learning Hours: 3 Hrs./week	**Credits: 3-0-0** In- Semester Examination-I: 15 Marks In- Semester Examination-II: 15Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs
Prerequisite	Basic knowledge of electronics, sensors, control systems, and agricultural field operations.
Objectives	1. To introduce the fundamentals and practical applications of Internet of Things (IoT) in agriculture. 2. To impart knowledge about automation techniques and technologies used in precision farming and smart agriculture.
Unit-I	**Introduction to IoT in Agriculture:** Definition, concept and architecture of IoT; IoT system components: sensors, controllers, actuators, communication devices; Scope and application in agriculture. (6 Hrs.)
Unit-II	**Sensors and Actuators:** Types of sensors for soil moisture, temperature, humidity, light, pH, crop health, etc.; Actuators for irrigation, fertigation, spraying, and climate control; Sensor calibration and data logging; Integration of sensors and actuators in field operations. (6 Hrs.)
Unit-III	**Communication Technologies in Smart Agriculture:** Overview of wireless communication protocols: Wi-Fi, Bluetooth, ZigBee, LoRa, GSM/GPRS; Role of gateways and repeaters; Data transmission and cloud connectivity; Introduction to cloud platforms like ThingSpeak, Google Firebase, and AWS IoT. (6 Hrs.)
Unit-IV	**Embedded Systems and Automation Control:** Introduction to microcontrollers and boards: Arduino, Raspberry Pi; Basics of programming and interfacing with agricultural sensors; Concepts of feedback and control systems in automation; Use of relay modules and motor drivers. (7 Hrs.)
Unit-V	**Automation in Agricultural Practices:** Application of automation in irrigation scheduling, fertigation systems, greenhouse climate control, pest and disease detection, and precision seeding; Automated machines for harvesting, spraying, and weeding; Integration of AI/ML in farm automation. (7 Hrs.)

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Unit-VI	**Case Studies and Future Trends in Agri-Automation:** Case studies on successful implementation of IoT and automation in Indian and global agriculture; Cost-benefit analysis; Challenges in adoption; Socio-economic and ethical concerns; Emerging trends: AI, robotics, blockchain, and digital twins in agriculture. (7 Hrs.)

	Sr. No.	Title	Author	Publication	Edition
Textbooks (T), Reference Books (R), and E-Sources	**T1**	IoT and Applications	Raj Kamal	McGraw Hill India	First, 2020
	T2	Introduction to Internet of Things (IoT)	Sudip Misra, Anandarup Mukherjee	Cambridge University Press India	First, 2021
	T3	Fundamentals of Precision Agriculture	M. L. Jat	Scientific Publishers	First, 2016
	R1	Smart Agriculture: An Introduction	Satish Shah	New India Publishing Agency	First, 2021
	R2	Arduino Based Projects for Beginners	Arun Kumar	BPB Publications	First, 2018
	R3	Remote Sensing and GIS for Agriculture	J.P. Sharma	New India Publishing Agency	First, 2017
	E1	https://www.iotforall.com/			

Course Outcomes (COs)

CO1: Describe the concept, components, and architecture of IoT and its relevance in agriculture. (Level: Remembering)

CO2: Explain the working and applications of sensors and actuators used in agricultural automation. (Level: Understanding)

CO3: Analyze data transmission, wireless communication protocols, and cloud integration in smart farming. (Level: Analyzing)

CO4: Apply automation tools and embedded systems in precision farming operations such as irrigation, fertigation, and pest control. (Level: Applying)

CO5: Evaluate the role of IoT and automation in enhancing productivity, resource efficiency, and decision support in agriculture. (Level: Evaluating)

CO6: Propose sustainable agri-tech solutions integrating IoT and automation for small and large-scale farming systems. (Level: Creating)

CO-PO Mapping Matrix

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	0	0	0	0	2	1	0	2	
CO2	2	3	2	1	1	1	0	2	1	0	2	
CO3	1	2	3	2	2	1	1	3	2	1	3	
CO4	1	2	3	3	2	2	1	3	2	1	3	
CO5	1	2	2	3	3	2	2	3	2	2	3	
CO6	1	2	2	3	3	3	3	3	3	2	3	

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Multidisciplinary Minor Vertical- Agricultural Engineering

Faculty of Science & Technology Syllabus of Third Year B.Tech. (Agricultural Engineering) (Semester VI)	
Course Category: MDM Course Code: **AED386** Course: **Sensors & Drone application LAB** Teaching Scheme: Practical: 02 Hrs/Week	**Credits: 0-0-1** Teacher Assessment: 25 Marks

Prerequisite	Basic understanding of electronics, agriculture field operations, and introductory knowledge of IoT and automation
Objectives	1. To develop hands-on experience with commonly used agricultural sensors and data acquisition systems. 2. To impart practical skills in drone operations for data collection, crop monitoring, and field mapping.
List of Experiment	1. Study and demonstration of temperature, humidity, and soil moisture sensors used in agriculture. 2. Calibration of soil pH and EC sensors and testing on soil samples. 3. Installation and working of automated irrigation using moisture sensors and microcontrollers 4. Measurement of light intensity (PAR) using photometric sensors/LUX meter in a crop canopy. 5. Introduction to drone types, components, and safety protocols. 6. Pre-flight checklist and assembly procedure for a quadcopter drone. 7. Field demonstration of manual drone flight and GPS tracking. 8. Aerial photography using drones for crop monitoring and documentation. 9. Geo-tagging of field boundaries using drone and GPS data. 10. Image digitization using QGIS **Note:** **All 10 experiments** must be performed by each student from the list provided in the syllabus. **The laboratory record book** must be maintained and submitted regularly for assessment.

Course Outcomes (COs)

CO1: Operate and calibrate agricultural sensors and implement basic automated systems for field data acquisition and control. (Level: Applying)

CO2: Demonstrate the use of drones for field mapping, GPS-based geotagging, aerial crop monitoring, and image processing. (Level: Applying)

CO-PO Mapping Matrix

CO \	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	2	2	1	1	2	1	1	2	
CO2	1	2	3	2	2	2	2	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 (Third year B. Tech Onwards)

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	V	PPE311	Polymeric Materials and Testing	3	-	-	3	3
	2	V	PPE336	Polymeric Materials and Testing Lab	-	-	2	2	1
	3	VI	PPE361	Polymer Processing Techniques	3	-	-	3	3
	4	VI	PPE386	Polymer Processing Techniques Lab	-	-	2	2	1
	5	VII	PPE411	3D Printing with Polymers	3	1	-	4	4
	6	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 V)**	
Course Category: **MDM** Course Code: **PPE311** Course: **Polymeric Materials and Testing** Teaching Scheme: Theory: 3 Hrs/week Self-Learning Hours: 3 Hrs./week	**Credits: 3-0-0** In- Semester Examination-I: 15 Marks In- Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher's Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisite	Nil
Objectives	1. To acquire knowledge on different types of polymeric materials. 2. To gain knowledge on different types of testing of polymer.
Unit-I	**Introduction:** Overview of polymeric materials, classification and chemical structures of polymeric materials, significance of polymer testing, destructive and non-destructive testing. **(05 Hrs)**
Unit-II	**Thermoplastic Polymers:** Structure, properties and applications of PE, PP, PS, PET, PVC, Nylon 6, ABS. **(07 Hrs)**
Unit-III	**Polymeric Resins:** Structure, properties and applications of Epoxy, Alkyd, PF, MF and UF resin. **(06 Hrs)**
Unit-IV	**Miscellaneous Polymeric Materials:** Structure, properties and applications of polyurethane, PC, PEEK and natural rubber. **(06 Hrs)**
Unit-V	**Testing of Mechanical Properties:** Working principle and application of tensile, tear, hardness (Shore A and Shore D), compression, impact, flexural strength, abrasion test. **(08 Hrs)**
Unit-VI	**Miscellaneous Testing Methods:** Working principle and application of desity, MFI, refractive index, opacity, limiting oxygen index, heat distortion temperature, Vicat softening temperature, electrical conductivity testing. **(07 Hrs)**

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	Sr. No.	Title	Author	Publication	Edition
Text books/ Reference books	1.	Polymer Science and Technology Plastics, Rubbers, Blends and Composites	Premamoy Ghosh	McGraw-Hill	3rd
	2.	Polymer Science	Vasant R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar	Wiley	5th
	3.	Textbook of Polymer Science	Fred W. Billmeyer	Wiley	3rd
	4.	Handbook of Polymer Testing Physical Methods	Roger Brown	CRC Press	1st

Course Outcomes

CO1	Classify polymers and testing methods based on structure and purpose.
CO2	Compare thermoplastics, resins, and rubbers in terms of properties and applications..
CO3	Perform mechanical tests to evaluate polymer strength and performance.
CO4	Interpret results from thermal, optical, and electrical tests on polymers.

CO-PO Mapping:

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

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Multidisciplinary Minor Vertical- Plastic and Polymer Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Plastic and Polymer Engineering) (Semester V)	
Course Category: MDM Course Code: PPE336 Course: Polymeric Materials and Testing Lab Teaching Scheme: Practical: 02 Hrs/Week	**Credits: 0-0-1** Teacher Assessment: 25 Marks

Prerequisite	Nil
Objectives	1. To apply different testing methods for polymeric materials.
List of Practicals	1. To determine density/specific gravity of a given polymer. 2. To determine opacity of a given polymer. 3. To determine tensile strength of a given polymer. 4. To determine the modulus of a given polymer at a specific strain. 5. To determine ash content in a given polymeric material. 6. To determine Shore A hardness of a given polymer. 7. To determine Shore D hardness of a given polymer. 8. To determine melt flow index of a given polymer. 9. To determine surface resistivity of a given polymer. 10. To determine impact strength of a given polymer. 11. To determine compression strength of a given polymer. 12. To determine flexural strength of a given polymer. **Note: Minimum 10 practicals should be performed**

Course Outcomes

CO1	Identify and classify polymers based on structure, properties, and applications.
CO2	Perform standard tests to evaluate mechanical, thermal, and electrical properties of polymers.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1			1	1		1		1
CO2	3	2	1	2		1	1	2	1		1

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Multidisciplinary Minor Vertical- Plastic and Polymer Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Plastic and Polymer Engineering) (Semester VI)	
Course Category: MDM Course Code: PPE361 Course: Polymer Processing Techniques Teaching Scheme: Theory: 3 Hrs/week Self-Learning Hours: 3 Hrs./week	**Credits: 3-0-0** In- Semester Examination-I: 15 Marks In- Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher's Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisite	Basics of Plastics materials
Objectives	To get the knowledge of different techniques of processing of Polymers
Unit-I	**Injection Moulding:** Introduction, basic terminologies, material, construction and working of reciprocating screw type of injection moulding, process parameters and their effect, troubleshooting, safety aspects. **(09 Hrs)**
Unit-II	**Compression Moulding:** Materials, construction and working of compression moulding, process parameters and their effect, troubleshooting, safety aspects. **(05 Hrs)**
Unit-III	**Transfer Moulding:** Materials, construction and working of pot and plunger type machines, process parameters and their effect, troubleshooting, safety aspects. **(05 Hrs)**
Unit-IV	**Extrusion:** Materials, construction and working of single and twin screw extruder, film, sheet and pipe extrusion, process parameters and their effect, troubleshooting, safety aspects. **(10 Hrs)**
Unit-V	**Roto Moulding:** Materials, construction and working of carousal, Rock n Roll and shuttle type machines, process parameters and their effect, troubleshooting, safety aspects. **(05 Hrs)**
Unit-VI	**Blow Moulding:** Materials, construction and working of Injection blow, extrusion blow and stretch blow moulding machines, process parameters and their effect, troubleshooting, safety aspects. **(05 Hrs)**

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	Sr. No.	Title	Author	Publication	Edition
Text books/ Reference books	1.	Plastics Processing Handbook	A S Athalye	Colour Publication Pvt Ltd.	1st
	2.	SPI PlasticsEngineering Handbook	Michael Berins	Springer	5th
	3.	Plastics Engineering Handbook	J. Frados	Van Nostrand Reinhold Company	4th
	4.	Principles of Polymer Processing	A Tadmor and C G Gagos	John Willey and Sons	2nd

Course Outcomes

CO1	Explain the basic fundamentals of polymer processing.
CO2	Illustrate the construction and working of polymer processing methods.
CO3	Summarize the effect of process parameters on product quality.
CO4	Solve the processing related product defects.

CO-PO Mapping:

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

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Multidisciplinary Minor Vertical- Plastic and Polymer Engineering

Faculty of Science & Technology Syllabus of Multidisciplinary Minor (Plastic and Polymer Engineering) (Semester V)	
Course Category: MDM Course Code: PPE386 Course: Polymeric Processing Techniques Lab Teaching Scheme: Practical: 02 Hrs/Week	**Credits: 0-0-1** Teacher Assessment: 25 Marks

Prerequisite	Basics of Plastics materials
Objectives	To get the practical knowledge of different techniques of processing of Polymers
List of Practicals	1. To study and practice the safety aspects necessary on shop floor. 2. To set up the reciprocating screw type injection moulding machine for processing. 3. To produce an article from reciprocating screw type injection moulding machine. 4. To troubleshoot an injection moulding product defect along with estimation of the product cost. 5. To perform extrusion compounding and/or extrusion recycling of a thermoplastic material. 6. To perform compression moulding of thermoplastic/thermoset material. 7. To perform rotational moulding for thermoplastic material. 8. To perform blow moulding of a bottle. 9. To study the construction and working of thermoforming process. 10. To study the construction and working of calendaring process. 11. To study the construction and working of hand injection moulding machine. 12. To study process of making multi layered roto moulded product. **Note: Minimum 10 practicals should be performed**

Course Outcomes

CO1	Make use of processing machines to get the output.
CO2	Apply all the safety measures during processing of polymers.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	1	1						
CO2	3	2	3			3	3	1	1	1	2

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