MIT
Quest for Excellence

Maharashtra Institute of Technology

Chhatrapati Sambhajinagar

An Autonomous Institute Affiliated to

Dr. Babasaheb Ambedkar Marathwada University,

Chhatrapati Sambhajinagar, Maharashtra (India)

Final Year B. Tech Syllabus

(Plastic and Polymer Engineering)

(Autonomous Pattern Curriculum)

WEF AY 2024-25

****

Master Copy

Abbreviations used in this document

CIE	Continuous Internal Examination
ESE	End-Semester Examination
INT	Internship
L	Theory Lecture
MSE	Mid-Semester Examination
MIT	**Maharashtra Institute of Technology**
OE	Open Elective Course
P	Practical
PC	Program Core Course
PE	Program Elective Course
PPE	**Plastic and Polymer Engineering**
PRO	Project
S7	Semester -VII
S8	Semester -VIII
T	Tutorial
TA	Teacher Assessment
WEF	With Effect From

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Final Year B. Tech (Plastic and Polymer Engineering) Syllabus Structure

WEF 2024-25 (Autonomous Pattern Curriculum)

Semester-VII

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Credits	MSE-I	MSE-II	CIE	TA	ESE / Oral	Total
Orientation Program (2 Days)														
1.1	PE	PPE 431-433	Professional Elective-II	3	-	-	3	3	15	15	10	10	50	100
1.2	PE	PPE 434-436	Professional Elective-III	3	-	-	3	3	15	15	10	10	50	100
1.3	PE	PPE 437-439	Professional Elective-IV	3	-	-	3	3	15	15	10	10	50	100
1.4	OE	###	Open Elective-IV	3	-	-	3	3	15	15	10	10	50	100
1.5	OE	###	Open Elective-V	3	-	-	3	3	15	15	10	10	50	100
1.6	PC	PPE 421	Lab-I: CAE for Plastics	-	-	2	2	1	-	-	-	25	-	25
1.7	PC	PPE 422	Lab-II: Chemical Engineering Laboratory	-	-	2	2	1	-	-	-	25	-	25
1.8	PRO	PPE 423	Major Project-II	-	-	8	8	4	-	-	-	50	50	100
S7				**15**	**-**	**12**	**27**	**21**	**75**	**75**	**50**	**150**	**300**	**650**

Semester-VIII

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Credits	MSE-I	MSE-II	CIE	TA	ESE / Oral	Total
2.1	INT	INT471	Internship	-	-	-	$	18	-	-	-	200	350	550
2.2	INT	INT472	Grand Viva	-	-	-	$	3	-	-	-	-	100	100
S8				**-**	**-**	**-**	**$**	**21**	**-**	**-**	**-**	**200**	**450**	**650**

Department-wise Codes

$ Contact hours are not mentioned as the students are doing the internship in the Industry/research organization, etc. The students are having the engagement of 36-40 Hours per wk during the Internship. Also for the course called "Grand Viva" students are preparing for the course as per the course guidelines in self-paced mode in guidance with mentors assigned by the department.

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Dean (Academics)
Maharashtra Institute of Technology,
(An Autonomous Institute)
Chhatrapati Sambhajinagar,M.S.-431010

Chairman Academic Council
MIT Aurangabad
(An Autonomous Institute)

Professional Elective-II Course Basket:

Course Code	Course Title
PPE431	Polymer Blends and Composites
PPE432	Polymer Physics
PPE433	Advanced Polymer Chemistry

Professional Elective-III Course Basket:

Course Code	Course Title
PPE434	Advanced Elastomer Technology
PPE435	Coating and Adhesive Technology
PPE436	Technical Textile

Professional Elective-IV Course Basket:

Course Code	Course Title
PPE437	Polymer Reaction Engineering
PPE438	Industrial Plant Design
PPE439	Mass Transfer

Open Elective-IV Course Basket:

Course Code	Course Title	Name of Department offering the Course
AED441	Renewable Energy Sources	Agricultural Engineering
CED441	Disaster Management	Civil Engineering
CSE441	Digital Forensics	Computer Science and Engineering
ECE441	Augmented Reality and Virtual Reality	Electronics and Computer Engineering
EED441	Electrical Conservation and Audit	Electrical Engineering
AID441	Big Data Analytics	Emerging Science and Technology
MED441	Electrical Vehicles	Mechanical Engineering
PPE441	Packaging Technology	Plastic and Polymer Engineering

Open Elective-V Course Basket:

Course Code	Course Title	Name of Department offering the Course
AED442	Climate Resilient Agriculture	Agricultural Engineering
CED442	Smart City Planning and Management	Civil Engineering
CSE442	E-Commerce	Computer Science and Engineering
ECE442	Electronic Waste Management	Electronics and Computer Engineering
EED442	Photovoltaic System Design	Electrical Engineering
AID442	Social Media Analytics	Emerging Science and Technology
MED442	Management Techniques	Mechanical Engineering
PPE442	Specialty Polymers	Plastic and Polymer Engineering

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Dean (Academics)
Maharashtra Institute of Technology,
(An Autonomous Institute)
Chhatrapati Sambhajinagar,M.S.-431010

Chairman Academic Council
MIT Aurangabad
(An Autonomous Institute)

Semester-VII
Detail Course Curriculum

Final Year B. Tech Syllabus
(Plastic and Polymer Engineering)

(Autonomous Pattern Curriculum)

WEF AY 2024-25

Master Copy

This page is intentionally left blank

Faculty of Science & Technology

Syllabus of Final Year B. Tech (Plastic and Polymer Engineering) (Semester VII)

Course Code: PPE431 **Course: Professional Elective-II** **Polymer Blends and Composites** Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Polymeric Materials, Additives, polymer processing and testing.
Objectives	1. To understand the basics of blends and composites. 2. To understand the raw material and preparation of blends and composites. 3. To get the knowledge of composite processing techniques. 4. To understand the analysis of blends and composites.
Unit-I	**Introduction to Polymer Blends and Composites:** Significance of polymeric blends and composites, various materials used in blending and preparation of composites, rubber toughened polymer blends, applications of polymeric blends and composites. **(4 Hrs)**
Unit-II	**Polymer Blends:** Interface and interphase, miscible and immiscible blends, thermodynamics of polymer blending, UCST and LCST, polymer-solvent and polymer-polymer systems, Flory-Huggins theory, phase separation mechanisms. **(7 Hrs)**
Unit-III	**Compatibilization and Blending:** A) Compatibilization Polymer-polymer interface interaction, interphase formation, strategies to improve interface interactions, compatibilization mechanisms, compatibilizers and coupling agents. B) Interpenetrating Network Introduction, classification, methods of preparation and applications of interpenetrating network. **(7 Hrs)**
Unit-IV	**Fillers and Reinforcement:** Reinforcing and non-reinforcing fillers, effect of shape and size of fillers. Classification, properties and applications of short fiber, continuous fiber (natural and synthetic), particulate filler and nano-filler. Rules of reinforcement (Guth and Gold equation, critical fiber length, modulus of fiber reinforced composites). **(7 Hrs)**
Unit-V	**Polymer Composites:** Polymer composite preparation methods (melt and solution mixing), mechanisms (intercalation, exfoliation, dispersion, distribution, orientation, percolation etc.) and processing techniques (hand lay-up, spray-up, pultrusion, filament winding, resin transfer molding, vacuum bagging), Rules of mixture. **(7 Hrs)**

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

Unit-VI	**Analysis of Polymer Blends and Composites:** Selection of suitable characterization methods, selection and sample preparation techniques (surface, bulk, tensile fracture, cryo-fracture, solvent etching, cryo-grinding, selective staining, solvent systems etc.) **(4 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Polymer Blends Handbook	Leszek A. Utracki, Charles A. Wilkie	Springer	2nd
2.	Polymer Blends (Vol. 1)	D. R. Paul Seymour Newman	Academic Press	1978
3.	Polymer matrix composites and technology	Ru-Min Wang, Shui-Rong Zheng and Ya-Ping Zheng	Woodhead Publishing	2011
4.	Manufacturing techniques for polymer matrix composites (PMCs)	Suresh G. Advani, Kuang-Ting Hsiao	Woodhead Publishing	2012
5.	Particulate-Filled Polymer Composites	Roger N. Rothon	Rapra Technology	2nd
6.	Processing of Polymer Matrix Composites	P. K. Mallick	CRC Press	2018

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology

Syllabus of Final Year B. Tech (Plastic and Polymer Engineering) (Semester VII)

Course Code: PPE432 **Course: Professional Elective-II** **Polymer Physics** Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Introduction to Polymer Engineering, Physical Chemistry of Polymers.
Objectives	1. Explain concepts and solve problems associated with polymer physics. 2. Describe the structural and physical behaviour of polymers. 3. Present and interpret the results of own research on the basis of the fundamental knowledge provided in the course.
Unit-I	**Fundamentals of Polymer Physics:** Potential energy and conformational energy of molecules - conformations and configurations, primary and secondary bonds including potential functions, isomeric states and isomerism in polymers, stereoisomerism, geometric isomerism - random coils and average end-to-end distance, overview of structure and phase transitions in polymers, physical and chemical methods of determining microstructures. **(6 Hrs)**
Unit-II	**Rubber Elasticity:** Thermodynamic relationships including a simple description of entropy and enthalpy forces, statistical mechanical models (affine network and phantom network), real polymer networks – loose chain ends, trapped entanglements (Langley model), Flory-Rehner model, and finally an overview of then more novel models. **(6 Hrs)**
Unit-III	**Glassy State of Polymers:** Glass transition temperature and its dependence on molecular structure and architecture, the free volume concept, plasticization, physical aging – phenomenology, models and theory, sub-glass processes, molecular interpretation of the glass transition, and the structure of glassy polymers. **(6 Hrs)**
Unit-IV	**Crystalline State of Polymers:** General considerations, methods of determining crystal structure, the unit cell of crystalline polymers, structure of crystalline polymers, crystallization from the melt, kinetics of crystallization, the re-entry problem in lamellae, thermodynamics of fusion, effect of chemical structure on the melting temperature, fiber formation and structure. **(6 Hrs)**
Unit-V	**Semicrystalline Polymers:** Polymer crystallography, the crystal lamella, superstructures (spherulites, axialtites and oriented superstructures) relation with lamellar structure including the segregated structures, crystallinity, melting point and how it is related to crystal thickness (Thomson-Gibbs equation),crystallization kinetics–theories (overview), kinetics growth theories, and finally an overview of the theories including a critical metastable phase. **(6 Hrs)**

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Unit-VI	**Amorphous State of Polymers:** The amorphous polymer state, experimental evidence regarding amorphous polymers, conformation of the polymer chain, macromolecular dynamics. **(6 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Introduction to Polymer Physics	M. Doi,	Clarendon Press	1996
2.	Principles of Polymer chemistry	P. J. Flory	Cornell University Press	1953
3.	Introduction to Physical Polymer Science	L.H. Sperling	Wiley-Interscience	4th

Web links of MOOC courses

1. https://onlinecourses.nptel.ac.in/noc19_ch28/preview
2. https://archive.nptel.ac.in/courses/103/103/103103139/

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology

Syllabus of Final Year B. Tech (Plastic and Polymer Engineering) (Semester VII)

Course Code: PPE433 **Course: Professional Elective-II** **Advanced Polymer Chemistry** Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	The students should have a clear concept of the traditional polymers, their processing techniques, their properties and applications.
Objectives	1. This course is intended to update the students about various modern polymerization techniques, synthetic polymers made by newer techniques, new class of additives being used for polymer processing. 2. The student will have a basic knowledge of the advancements taking place in the field of plastics.
Unit-I	**Polymerization Techniques and Property Relationship:** Linear and crosslinked polymers, effect of process of polymerization on the properties of the polymer in addition polymers (bulk, suspension, solution, emulsion and precipitation polymerization). **(5 Hrs)**
Unit-II	**Monomer Recovery Techniques for Condensation Polymers:** Pyrolytic GCMS, polyesters, polyamides, polyurethanes depolymerization for identification of monomers. **(6 Hrs)**
Unit-III	**Polymer Chemistry and Nature** Life, DNA, reproduction with seeds, sperms. **Modified Natural Polymers** CA, CAP, CAB, ethyl cellulose, hydroxyethyl cellulose, methyl cellulose, CMC, micro crystalline cellulose. Modified Guar gum. **(7 Hrs)**
Unit-IV	**Structurally Modified Polymers:** Orientation of polymers, fibre forming polymers, conditions for fibre formation, wire enamels, castables, PVC compounds for cables. **(4 Hrs)**
Unit-V	**Polymer Architecture and Advanced Polymerization Techniques:** a) Techniques of polymer architecture b) Advanced polymerization techniques i. Cationic and anionic polymerization ii. Nitrite mediated polymerization iii. ATRP iv. RAFT v. GTP vi. Precipitation polymerization as a tool to get very low poly dispersity factor. **(8 Hrs)**

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

Unit-VI	**Additives for Polymers** a) Stabilizers, antioxidants b) Degradation c) Antistatic additives d) UV and heat stabilization with special reference to PVC e) Antibacterial additives f) Anti rodent and anti-termite additives g) Fire retardants h) Reduction of permeability i) Increasing electrical conductivity **(6 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Recent Advances in Polymer Chemistry	James Archer	Random Publications	2013
2.	Advances in Polymer Science	Vikas Mittal	Central West Publishing	2019
3.	Advances in Sustainable Polymers Synthesis, Fabrication and Characterisation	Katiyar, Vimal, Kumar, Amit, Mulchandani, Neha	Springer	2020
4.	Polymer Chemistry (Advances in Polymer Science)	Akihiro Abe, Ann Christine Albertsson	Springer	2013

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology Syllabus of Final Year B. Tech (Plastic and Polymer Engineering) (Semester VII)	
Course Code: PPE434 Course: Professional Elective-III Advanced Elastomer Technology Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Elastomer Technology
Objectives	To acquire knowledge about the fundamentals about miscellaneous rubber products. To understand the working principles of different rubber products.
Unit-I	**Fundamentals of Tyre Technology:** Construction, nomenclature and the characteristics of different components of tyre. Radial and bias tyre. Different types of tread designs. Bead nomenclature. **(6 Hrs)**
Unit-II	**Tyre Manufacturing:** Selection of rubbers for different components of tyre. Compounding formulation of different components. Tyre manufacturing process. **(6 Hrs)**
Unit-III	**Tyre Testing and Analysis:** Tyre magic triangle. Quality control of tyre-specific testing methods (e.g. load/speed, plunger energy, noise, endurance, rolling resistance, traction). Significance of Payne effect. **(6 Hrs)**
Unit-IV	**Rubber Seals:** Classification and working principle of seals. Properties for functional seal requirements, Formulation and compounding of O-rings and seals, performances of different rubbers for use in seal including formulation. **(6 Hrs)**
Unit-V	**Miscellaneous Rubber Products:** Fundamental characteristics, preparation, properties and applications of miscellaneous rubber products: rubber-coated fabrics, damper, vibration isolator, cable, v-belt, hose, mattress (Dunlop and Talalay process). **(10 Hrs)**
Unit-VI	**REACH Guidelines** Registration, evaluation, authorization and restriction of chemicals (REACH) – working mechanism, effects on companies, and guidelines for recovered polymers. **(2 Hrs)**

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

	Sr. No.	Title	Author	Publication	Edition
References	1.	Handbook of Elastomers	Anil K. Bhowmick, Howard Stephens	CRC Press	2000
	2.	Science and Technology of Rubber	James E. Mark, Burak Erman, Frederick R. Eirich	Elsevier	2005
	3.	Hose Technology	C W Evans	Elsevier Applied Science	1979
	4.	Rubber Technology	Maurice Morton	Van Nostrand Conpany Inc.	1987
	5.	The Rubber Formulary	P A Ciullo, N. Hewitt	Noyes/William Andrew Publishing	1999
	6.	Rubber Seals for Fluid Hydraulic systems	V. C. Chandrasekaran	Elsevier	2010
	7.	Rubber Technologist Handbook	Sadhan K. De, Jim. R. White	Rapra	2001
	8.	Textile for Industrial Applications	R. Senthil Kumar	CRC Press	2014

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology

Syllabus of Final Year B. Tech (Plastic and Polymer Engineering) (Semester VII)

Course Code: PPE435 **Course: Professional Elective-III** **Coating and Adhesive Technology** Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Basics of paint technology
Objectives	1. To make the students aware of the essential components of paints and coatings. 2. To make the students familiar with the basic and recent advancements in coating technologies.
Unit-I	**Water Borne and Other Coatings:** Preparation of latex for paints, chemistry and technology of emulsion and latex paints, developments in waterborne coating, preparation and characteristics of coil coating, UV cured coating, anti-corrosive coating, non-stick coating, automotive coating. (6 Hrs)
Unit-II	**Various Surface Coatings:** Road marking coating, insulating coating, metallic coating, leather coating, and fire-retardant/fire resistive coating, powder coating, dry distempers, cement paints, oil-based distempers and paints. **(6 Hrs)**
Unit-III	**Technology of Construction Chemicals:** Adhesives and sealants, waterproofing compounds, polymeric additives for concrete admixtures, wood finishes, novelty finishes. **(6 Hrs)**
Unit-IV	**Surface Preparation and Natural Adhesives Materials:** Introductory idea about various surface preparation methods, surface tension, surface free energy, work of adhesion, contact angle and effect of temperature on surface tension. Animal glue, casein and mixed protein adhesives, starch-based adhesives, natural rubber adhesives. **(6 Hrs)**
Unit-V	**Synthetic Adhesives Materials:** Nitrile Rubber, SBR, carboxylic polymers, polysulfide, phenolic, amino, epoxy, polyurethane, polyvinyl acetate, polyvinyl alcohol, acrylic, polyester and polyamide-based adhesives, silicones, silanes and non-silane coupling agents. **(6 Hrs)**
Unit-VI	**Surface and Material Characterization Techniques** Rheological properties, optical properties, adhesion and mechanical properties, corrosion and chemical resistance properties, hardness, scratch test, peel test. **(6 Hrs)**

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

	Sr. No.	Title	Author	Publication	Edition
References	1.	Chemistry, Materials and Properties of surface coatings	Gungor Gundoz	Destech Pub	-
	2.	Handbook of Adhesives	lrving Skeist	Chapman & Hall	1st
	3.	Surface Coating Technology Handbook	NPCS Board	Asia Pacific Business Press	-
	4.	Handbook of Adhesives and Surface Preparation	Sina Ebnesajjad	Elsevier	1st

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology Syllabus of Final Year B. Tech (Plastic and Polymer Engineering) (Semester VII)	
Course Code: PPE436 Course: Professional Elective-III Technical Textiles Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Nil
Objectives	1. To acquire knowledge about the diversified applications of technical textiles. 2. To understand the characteristic requirements for applicability of technical textiles.
Unit-I	**Introduction:** Fundamentals of textile fibers and basic terminologies. Classifications of fibers, yarns and fabrics. Outline about manufacturing processes of yarns and fabrics. Miscellaneous applications of technical textiles. **(6 Hrs)**
Unit-II	**Textiles in Filtration:** Dust collection, types of yarn, fabric construction, finishing treatments, solid-liquid separation, nanofibers in filtration. **(6 Hrs)**
Unit-III	**Geotextiles:** Introduction, functions of geotextiles. Selection of fibers, manufacturing process, characteristics and applications of geotextiles. **(6 Hrs)**
Unit-IV	**Textiles in Healthcare and Hygiene:** Introduction, use of fibers, implantable and non-implantable materials. Applications of fibers in artificial organs. Wound dressing products, sanitary napkin, diaper. **(6 Hrs)**
Unit-V	**Textiles for Protection and Safety:** Introduction, fire-fighting suit, space suit, bulletproof and stab-proof textiles. Protective clothing for hazardous chemicals, hot and cold environment and impact damage. Camouflage fabric. **(6 Hrs)**
Unit-VI	**Textiles for Electrical and Electronic Applications** Brief overview about the applications of technical textiles in the field of electric insulations, cables, EMI shielding, telecommunications, acoustics, circuit board, sensor, capacitor. **(06 Hrs)**

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

	Sr. No.	Title	Author	Publication	Edition
References	1.	Handbook of Technical Textiles (Volume 1): Technical Textile Process	A. Richard Horrocks, Subhash C. Anand	Woodhead Publishing, Elsevier	2016
	2.	Handbook of Technical Textiles (Volume 2): Technical Textile Applications	A. Richard Horrocks, Subhash C. Anand	Woodhead Publishing, Elsevier	2016
	3.	Textile Progress: Advanced Technical Textile Products	Tatsuki Matsuo	Taylor & Francis	-
	Web links of MOOC courses				
	1.	https://onlinecourses.nptel.ac.in/noc20_te06/preview			

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology Syllabus of Final Year B. Tech (Plastic and Polymer Engineering) (Semester VII)	
Course Code: PPE437 Course: Professional Elective-IV Polymer Reaction Engineering Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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 heat transfer, process calculations and mass transfer
Objectives	1. Students will be able to understand kinetics of various reactions. 2. Students will be able to understand the design of various types of reactors. 3. Students will be able to acquire knowledge related to reaction-controlling parameters.
Unit-I	**Introduction to Chemical Kinetics:** Classification of reactions, reaction rate and rate constant, molecularity and order of chemical reaction, elementary and nonelementary reactions, Arrhenius law, activation energy, effect of temperature. **(6 Hrs)**
Unit-II	**Interpretation of Batch Reactor Data:** Constant volume and variable volume batch reactions, zero order reactions, first order reactions, second order reactions, reversible and irreversible reactions. **(6 Hrs)**
Unit-III	**Reactor Design:** Performance equations of batch, CSTR, plug flow reactors, their relative merits and demerits. **(6 Hrs)**
Unit-IV	**Design of Single Reactions:** Size comparison of single reactors, series and parallel reactions, recycle reactor, autocatalytic reactions. **(6 Hrs)**
Unit-V	**Types and choice of Reactors / Heterogeneous reactions:** Mass transport with reaction, catalytic and noncatalytic, gas-solid reactions, gas-liquid reactions. **(6 Hrs)**
Unit-VI	**Reactor Design for Polymers** Reactors for PS, PVC, PET, LDPE, HDPE, LLDPE, PP, safety aspects for handling various reactors. **(6 Hrs)**

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

	Sr. No.	Title	Author	Publication	Edition
References	1.	Chemical Engineering Vol I & II	Richardson and Coulson	Mcgraw Hill Company	6th
	2.	Unit Operations of Chemical Engineering	McCabe & Smith	Mcgraw Hill Company	7th
	3.	Principles of mass transfer and separation processes	Binay Dutta	PHI learning Pvt.Ltd, New Delhi	-
	4.	Unit Operations of Chemical Engineering vol 1 & 2	Chattopadhyay P.	Khanna Publishers, New Delhi	-
	5.	Separation Process Principles	J. D. Seader, Ernest Henley	John Wiley & Sons	2nd

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology Syllabus of Final Year B. Tech (Plastic and Polymer Engineering) (Semester VII)	
Course Code: PPE438 Course: Professional Elective-IV Industrial Plant Design Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Nil
Objectives	1. Students will be able to understand the economic implications involved in developing a plant design project. 2. Students will be able to understand designs for a process through different sources. 3. To acquire knowledge related to plant design considerations for various polymers.
Unit-I	**Process Development and Design:** Process selection, literature survey, study of alternate process, development of project from laboratory and pilot plant data, scale-up methods for important equipments, types of design, selection of material of construction, flow sheet synthesis and development. **(6 Hrs)**
Unit-II	**Design of Heat exchangers:** Classification of heat exchangers, design of shell and tube heat exchanger and double pipe heat exchanger. **(6 Hrs)**
Unit-III	**Plant Location and Layout:** Plant location, site selection and preparation, design of plant layout and installation, principles of plant layout, technical evaluation of projects, performance evaluation parameters of process technology. **(6 Hrs)**
Unit-IV	**Piping Auxiliaries:** piping, selection of piping, nominal pipe size, properties of piping materials, process steam piping, piping layout, piping codes and standards, P&I diagrams, piping supports. **(6 Hrs)**
Unit-V	**Materials and Fabrication Selection:** Material of construction, mechanical properties of material, selection of material, economics in selection of materials, fabrication of equipment. **(6 Hrs)**
Unit-VI	**Plant design considerations for polymers** Polystyrene, PVC, HDPE, PP, Nylon-6, PET. **(6 Hrs)**

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

	Sr. No.	Title	Author	Publication	Edition
References	1.	Chemical Engineering Plant Design	Vibrandt & Dryden E.E.	McGraw Hill	4th
	2.	Plant Design & Economics for Chemical Engineers	Peter M.S. &Timmerhaus K.D.	McGraw Hill	4th
	3.	Process Design of Equipments	Dawande, S.D.	Central Techno Publications	5th
	4.	Perry's Chemical Engg. Handbook	R.H. Perry & Don W. Gress	McGraw Hill Company	7th
	5.	Chemical Engineering: Vol.6	Coulson J.M. and Richardson J.F	Pergamon Press	4th
	6.	Heat Transfer	J P Holman	McGraw Hill	6th
	7.	Piping Handbook	Mohinder Nayyar	McGraw Hill	7th
	Web links of MOOC courses				
	1.	https://archive.nptel.ac.in/courses/103/105/103105166/			

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology Syllabus of Final Year B. Tech (Plastic and Polymer Engineering) (Semester VII)	
Course Code: PPE439 Course: Professional Elective-IV Mass Transfer Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Students should have a basic understanding of Process Calculations and Heat Transfer.
Objectives	1. To understand the fundamental concepts of mass transfer principles and apply these concepts to real engineering problems. 2. To get acquainted with the design of continuous contact and stage-wise operations.
Unit-I	**Introduction to Molecular Diffusion:** Introduction and various mass transfer operations, classification of mass transfer operations, Ficks law, molecular diffusion in gases and liquids, types of diffusion. **(6 Hrs)**
Unit-II	**Interphase Mass Transfer and Mass Transfer Coefficients:** Equilibrium, diffusion between phases, local and average phase /overall mass transfer coefficients, mass transfer coefficients in laminar and turbulent flow, theories for mass transfer: film theory, penetration theory, surface renewal theory. **(6 Hrs)**
Unit-III	**Absorption:** Introduction, Ideal liquid solutions, material balance for one component transferred in countercurrent and cocurrent flow, equipment for gas liquid operations tray towers and packed column. **(6 Hrs)**
Unit-IV	**Distillation:** Vapour–liquid equilibria, Raoult's law, differential distillation and flash distillation, azeotropic distillation, extractive distillation, fractionation, graphical methods for estimation of number of stages required in distillation column by Mccabe Thiele method, reflux ratio. **(6 Hrs)**
Unit-V	**Liquid-liquid Extraction:** Introduction, equilateral triangular coordinates, single stage extraction, rotary disc contactors. **(6 Hrs)**
Unit-VI	**Drying** Constant rate and falling rate periods, equilibrium moisture contents, mechanism of batch drying continuous drying, time required for drying, drying equipments: rotary dryers, drum dryers. **(6 Hrs)**

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

	Sr. No.	Title	Author	Publication	Edition
References	1.	Mass Transfer Operation	R. E. Trybel	Mcgraw Hill Company	3rd
	2.	Chemical Engineering Vol I & II	Richardson & Coulson	McGraw Hill Company	6th
	3.	Unit Operations of Chemical Engineering	McCabe & Smith	McGraw Hill Company	7th
	4.	Principles of mass transfer and separation processes	Binay Dutta	PHI learning Pvt. Ltd, New Delhi	-
	5.	Unit Operations of Chemical Engineering vol 1 & 2	P. Chattopadhyay	Khanna Publishers, New Delhi	-
	Web links of MOOC courses				
	1.	https://archive.nptel.ac.in/courses/103/103/103103145/			

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-IV offered by Agricultural Engineering Department

Course Code: AED441 Course: Open Elective-IV Renewable Energy Sources Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Introductory courses in energy, environmental science, or engineering.
Objectives	To provide students with a comprehensive understanding of the fundamental concepts and principles of renewable energy sources, including solar, wind, hydro, geothermal, and biomass energy.
Unit-I	**Different Sources of Renewable Energy**- concepts and limitations of different renewable energy sources (RES) such as solar, wind, geothermal, biomass, and ocean energy sources; Criteria for assessing the potential of RES; Comparison of renewable energy sources with non-renewable sources. **(06 Hrs.)**
Unit-II	**Solar Energy**- energy available from the sun, solar radiation data, solar energy conversion into heat through flat plate and concentrating collectors, different solar thermal devices, the principle of natural and forced convection solar drying system; Solar photovoltaics- basics and applications, p-n junctions; Solar cells, PV systems, stand-alone, grid-connected solar power station; Calculation of energy through photovoltaic power generation and cost economics. **(06 Hrs.)**
Unit-III	**Wind Energy**- energy availability, general formula, lift and drag; Basics of wind energy conversion, effect of density, frequency variances, angle of attack, wind speed, types of windmill rotors, determination of torque coefficient, induction type generators; Working principle of wind power plant; Wind farms, aero-generators, wind power generation system. **(06 Hrs.)**
Unit-IV	**Biogas**- basics of anaerobic digestion, types and constructional details of biogas plants, biogas generation, and its properties, factors affecting biogas generation and usages, design consideration, advantages and disadvantages of biogas spent slurry. **(06 Hrs.)**
Unit-V	**Power Generation** from urban, municipal, and industrial waste; Ocean thermal and electric power generation, wave, and tidal power. **(06 Hrs.)**
Unit-VI	**Power Generation from Biomass** (gasification & Dendro-thermal);-Mini and micro hydel plants; Fuel cells and its associated parameters. **(06 Hrs.)**

Master Copy

Chairman Board of Studies
Agricultural Engineering

	Sr. No.	Title	Author	Publication	Edition
References	1.	Non-Conventional Energy Sources	Rai G D.	Khanna Publishers, New Delhi	1st
	2	Non-Conventional Energy Resources	Khan B H.	The McGraw Hill Publishers	1st
	3.	Biomass Gasification and Pyrolysis Practical Design and Theory	Basu P.	Academic Press	1st
	4.	Solar Energy Utilization	Rai G D.	Khanna Publishers, New Delhi	2nd

Chairman Board of Studies
Agricultural Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-IV offered by Civil Engineering Department

Course Code: CED441 Course: Open Elective-IV Disaster Management Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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 Soil, Water and Environment
Objectives	To provide a broad understanding of the basic concepts of Disaster Management with preparedness as a Civil Engineer
Unit-I	**Introduction:** Concepts and definitions: disaster, hazard, vulnerability, risks- severity, frequency and details, capacity, impact, prevention, mitigation. **(06 Hrs.)**
Unit-II	**Disasters:** Disasters classification; natural disasters (floods, drought, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires, etc.); and vulnerability profile of India, mountain and coastal areas, ecological fragility. Manmade disasters industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc. **(06 Hrs.)**
Unit-III	**Disaster Impacts:** Disaster impacts- environmental, physical, social, ecological, economic, political, health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters. **(06 Hrs.)**
Unit-IV	**Disaster Risk Reduction (DRR):** Disaster management cycle – its phases; prevention, mitigation, preparedness, relief, and recovery; structural and non-structural measures; risk analysis, vulnerability, and capacity assessment; early warning systems, post-disaster environmental response, water, sanitation, food safety, waste management, disease control, security, communications. **(06 Hrs)**
Unit-V	**Role of Government:** Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders. Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority. **(06 Hrs)**
Unit-VI	**Disasters, Environment and Development:** Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods. **(06 Hrs.)**

Chairman Board of Studies
Civil Engineering
MIT Aurangabad
(An Autonomous Institute)

	Sr. No.	Title	Author	Publication	Edition
References	1.	Disaster Risk Reduction in South Asia	Pradeep Sahni	Prentice Hall	4th
	2.	Handbook of Disaster Management: Techniques & Guidelines	Singh B.K.	Rajat Publication.	8th
	3.	Principle of Engineering Economic Analysis	Home page of National Disaster Management Authority	John Wiley	6th

Chairman Board of Studies
Civil Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-IV offered by Computer Science and Engineering Department

Course Code: CSE441 **Course: Open Elective-IV** **Digital Forensics** Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Understanding of network basics.
Objectives	1. Understand the fundamentals of digital forensics. 2. Understand the relationship between IT and forensics. 3. Learn best practices for incident response. 4. Understand the process of data acquisition and validation. 5. Analyse E-evidence, tools, and environment.
Unit-I	**Cyber Crime:** Definition and types of cybercrimes, electronic evidence and handling, electronic media, collection, searching and storage of electronic media, introduction to internet crimes, hacking and cracking, credit card and ATM frauds, cryptography. **(06 Hrs.)**
Unit-II	**Basics of the Internet:** World Wide Web, Domain Name System (DNS), Media Access Control (MAC) addresses, Internet Protocol (IP) addresses, network scanning with Nmap, subnet masking, IP configuration (Ipconfig), networking devices like routers, switches, and hubs, gateways, and various communication protocols such as HTTP, HTTPS, SMTP, and FTP. **(06 Hrs.)**
Unit-III	**Introduction to Digital Forensics:** History and evolution of digital forensics, Types of cybercrime, Benefits of computer forensics, Forensics readiness, Computer Forensic services, legal concerns and private issues., Digital Evidences **(06 Hrs.)**
Unit-IV	**Data Acquisition:** Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, and acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, and other forensics acquisition tools. **(06 Hrs.)**
Unit-V	**Incident Response Essentials:** Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case, Digital Imaging **(06 Hrs.)**
Unit-VI	**Forensic Tools and Processing of Electronic Evidence:** Introduction to Forensic Tools, Usage of Slack space, tools for Disk Imaging, Data Recovery, Vulnerability Assessment Tools, Encase and FTK tools, Anti Forensics and probable counters, retrieving information, process of computer forensics and digital investigations, processing of digital evidence, digital images. **(06 Hrs.)**

Chairman Board of Studies
Computer Science & Engineering
MIT Aurangabad
(An Autonomous Institute)

	Sr. No.	Title	Author	Publication	Edition
References	1.	Computer Forensics: Incident Response Essentials	Warren G. Kruse II and Jay G. Heiser, Addison Wesley	Addison-Wesley	2002
	2	Guide to Computer Forensics and Investigations	Nelson, B, Phillips, A, Enfinger, F, Stuart, C., Homson Course Technology, ISBN: 0-619-21706-5.	Taylor & Francis	2006

Chairman Board of Studies
Computer Science & Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-IV offered by Electronics and Computer Engineering Department

Course Code: ECE441 **Course: Open Elective-IV** **Augmented Reality and Virtual Reality** Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Mathematics, Physics, Programming and Problem Solving
Objectives	• To know basic concepts of virtual reality • To understand visual computation in computer graphics • To understand interaction between system and computer • To know application of VR in Digital Entertainment • To know basic concepts of augmented reality
Unit-I	**Introduction:** Introduction to Augmented-Virtual and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR, VR and MR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality. **(06 Hrs)**
Unit-II	**VR systems:** VR as a discipline, Basic features of VR systems, Architecture of VR systems VR hardware: VR input hardware: tracking systems, motion capture systems, data gloves, VR output hardware: visual displays. **(06 Hrs)**
Unit-III	**VR software development:** Challenges in VR software development, Master/slave and Client/server architectures, Cluster rendering, Game Engines and available sdk to develop VR applications for different hardware (HTC VIVE, Oculus, Google VR). **(06 Hrs)**
Unit-IV	**3D interaction techniques:** 3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation. **(06 Hrs)**
Unit-V	**AR software development:** AR software, Camera parameters and camera calibration, Marker-based augmented reality, AR Toolkit **(06 Hrs)**
Unit-VI	**Application of VR in Digital Entertainment:** VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR. **(06 Hrs)**

Chairman Board of Studies
Electronics & Computer Engineering
MIT Aurangabad
(An Autonomous Institute)

	Sr. No.	Title	Author	Publication	Edition
References	1.	Understanding Augmented Reality: Concepts and Applications	Alan B. Craig	Morgan Kaufmann	1st
	2.	Virtual Reality Technology	Burdea, G. C. and P. C offet.	Wiley IEEE Press	2nd
	3.	Developing Virtual Reality Applications, Foundations of Effective Design	Alan Craig, William Sherman and Jeffrey Will	Morgan Kaufmann	1st
	4.	Virtual Reality Systems	John Vince	Pearson Education Asia	1st

Chairman Board of Studies
Electronics & Computer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-IV offered by Electrical Engineering Department

Course Code: EED441 **Course: Open Elective-IV** **Energy Conservation and Audit** Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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 Power Systems, Electrical Machines, Power Plant Engineering.
Objectives	1. To illustrate current energy scenario and environmental effect of various energy sources. 2. To understand the concept Energy Conservation and various actions taken globally for energy conservation and sustainable development. 3. To introduce about various Energy Saving Opportunities and Technologies used in Thermal, Mechanical and Electrical Systems. 4. To familiarize the methods, procedure and economics involved in an energy audit. 5. To analyze the energy audit reports of various industries.
Unit-I	**Scenario and Environmental Concerns of Energy Sources** Energy Sources: Primary and Secondary, Conventional and Non-Conventional, Renewable and Non-Renewable, Commercial and Non-Commercial Energy Scenario: Indian and Global scenario for various energy sources Environmental Concerns – Climate Change, Pollution, Global Warming, Depletion of Ozone layer, Acid Rain, UNFCCC, Kyoto Protocol, COP, CDM, PCF, Carbon Emissions, Carbon Footprints, Carbon Credits, Sustainable Development and Role of Renewable Energy Sources. **(06 Hrs.)**
Unit-II	**Energy Conservation and Audit:** Energy conservation and its importance, Energy Conservation Act-2001 and its features, BEE and its role in Energy Conservation. Energy Audit – Need, Types, Methodology, Steps involved in Energy Audit, Energy Costs and Benchmarking, Measurements for Energy Audit, Instruments for Energy Audit, Duties and Responsibilities of Energy Manager and Energy Auditor. **(06 Hrs.)**
Unit-III	**Energy Efficiency in Thermal and Mechanical Systems:** Different Types of Thermal and Mechanical Energy Systems Used in Industries. Boiler: Construction and Working of Biolers, Efficiency by direct and indirect methods, Energy efficiency opportunities in boilers, Construction, Components and Energy conservation opportunities in HVAC, and refrigeration systems, compressed air systems, pumps, cooling towers, fans, pumps and Blowers. **(06 Hrs.)**
Unit-IV	**Energy Efficiency in Electrical Systems:** Electricity billing, electrical load management and maximum demand control, power factor improvement benefits, selection and location of capacitors, performance assessment of PF capacitors, **Utilities:** Energy conservation in generation, transmission, distribution & utilization Electric motors: motor efficiency, factors affecting motor performance, rewinding and

Chairman Board of Studies
Electrical Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

	motor replacement issues, energy saving opportunities with energy efficient motors. Energy efficient lighting and measures of energy efficiency in lighting system. **(06 Hrs.)**
Unit-V	**Energy Economics:** Planning, Implementation & monitoring of energy conservation project, Simple Payback Period, Time Value of Money- discount rate, Criteria for Assessing Energy Projects –(Net Present Value (NPV), Benefit/Cost Ratio (B/C), Inflation, Internal Rate of Return (IRR), All calculations and numerical interpretation. **(06 Hrs.)**
Unit-VI	**Case Studies and Performance Analysis:** Case studies on processes and energy conservation technologies used in various industrial sectors like Steel Plant, Thermal Plant, Industrial Building and Commercial Establishments and preparing audit reports. **(06 Hrs.)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Energy Technology	S Rao and B Parulekar	Khanna Publisher	1st
2.	Energy Management Handbook	Wayne C Turner	Fairmont Press	1st
3.	Guidebooks for National Certification Examination for Energy managers/ Energy Auditors Book 1	-	BEE	-
4.	Guidebooks for National Certification Examination for Energy Managers/Energy Auditors Book 2 – Thermal Utilities	-	BEE	-
5.	Guidebooks for National Certification Examination for Energy Managers/Energy Auditors Book 3- Electrical Utilities	-	BEE	-

Chairman Board of Studies
Electrical Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-IV offered by Emerging Science and Technology Department

Course Code: AID441 **Course: Open Elective-IV** **Big Data Analytics** Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Database Management System
Objectives	1. To Gain foundational knowledge of Big Data. 2. To understand the Big Data ecosystem. 3. To Understand Hadoop Eco System.
Unit-I	**Introduction:** Introduction to Big Data, Characteristics of Big Data, Challenges and applications of Big Data, Enabling Technologies for Big Data, Big Data Stack, Big Data distribution packages, Open-source technologies, Cloud and big data. **(06 Hrs.)**
Unit-II	**NOSQL Data Management:** Introduction to NoSQL, aggregate data models, key-value and document data models, relationships, graph databases, schema-less databases, materialized views, distribution models, master-slave replication. **(06 Hrs.)**
Unit-III	**Hadoop:** Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts. **(06 Hrs.)**
Unit-IV	**Map Reduce**: Map Reduce workflows, unit tests with MR Unit, test data and local tests, anatomy of Map Reduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats. **(06 Hrs.)**
Unit-V	**Hadoop Eco-System:** Hbase, Hbase Versus RDBMS, Big SQL, Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, Introduction to PIG, Execution User Defined Functions, Data Processing operators. **(06 Hrs.)**
Unit-VI	**Hive:** Apache Hive architecture, Hive shell, Hive services, Hive meta store, comparison with traditional databases, HiveQL, tables, querying data and user defined functions. **(06 Hrs.)**

Chairman Board of Studies
Computer Science & Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

	Sr. No.	Title	Author	Publication	Edition
References	1	Big Data and Analytics	Sima Acharya, Subhashini Chhellappan	Wiley	2015
	2	Hadoop: The Definitive Guide	Tom White	O'reilly	2012
	3	Big Data, Big Analytics: Emerging Business Intelligence and Analytic	Michael Mineli, Michele Chambers, Ambiga Dhiraj,	Wiley	2013
	4	Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data	Dirk de Roos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch	McGraw Hill	2012

Chairman Board of Studies
Computer Science & Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-IV offered by Mechanical Engineering Department

Course Code: MED441 **Course: Open Elective-IV** **Electrical Vehicles** Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Fundamentals of Mechanical Engineering, Basic Electrical and Electronics Engineering
Objectives	1 To understand the concept of electric vehicles. 2 To familiarize with the motors, drives and architecture for electric vehicles. 3 To understand different energy storage systems and the concepts of battery management systems. 4 To understand the modelling of various vehicle performance parameters. 5 To acquaint with the global scenario and future of electric vehicles.
Unit-I	**Introduction to Electric Vehicle (EV):** Review of Conventional Vehicles, Electric Vehicle Technology – History, Need, Classification of EV, General Layout and Configuration of EV, Components and Controls, Electric Vehicle, and the Environment. **(04 Hrs.)**
Unit-II	**Electric Vehicle Architecture and Vehicle Modelling:** Electric Vehicle Architecture: Battery Electric Vehicles, The IC Engine/Electric Hybrid Vehicles, Fueled EVs, EVs using Supply Lines, EVs which use Flywheels or Supercapacitors, Solar-Powered Vehicles, Vehicles using Linear Motors, EVs for the Future. Fundamentals of Regenerative Braking. Electric Vehicle **Modelling:** Introduction, Tractive Effort, Modelling Vehicle Acceleration, Modelling of Vehicle Range. **(08Hrs.)**
Unit-III	**Electric Propulsion System:** Motors (DC, Induction, BLDC): Types, Principle, Construction, Configuration and Control. **Electric Drive Trains (EDT):** Series HEDT (Electrical Coupling) – Power Rating Design, Peak Power Source (PPS); Parallel HEDT (Mechanical Coupling) – Torque Coupling and Speed Coupling. Switched Reluctance Motors (SRM) Drives – Basic structure, Drive Converter. **(06Hrs.)**
Unit-IV	**Energy Storages:** Batteries: Battery Parameters, Electrochemical Batteries - Lead-Acid Batteries, Nickel-based Batteries, Lithium-Based Batteries, Sodium-Air Batteries, Metal-Air Batteries. Supercapacitors and Flywheels, Hybridization of Energy Storages, Electric Supply System, EV Charging. **(06Hrs.)**
Unit-V	**Battery Pack:** Selection of battery for EVs & HEVs, Traction Battery Pack design, Requirement of Battery Monitoring, Battery State of Charge Estimation methods, Battery Cell equalization problem, thermal control, protection interface, SoC Estimation, Energy & Power estimation, Battery thermal management system, Battery Management System: Definition, Parts: Power Module, Battery, DC/DC Converter, load, communication channel,

Chairman Board of Studies
Mechanical Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

	Battery Pack Safety, Battery Standards & Tests. **(06Hrs.)**
Unit-VI	**Battery Testing, Disposal & Recycling:** Chemical & structure material properties for cell safety and battery design, battery testing, limitations for transport and storage of cells and batteries, Recycling, disposal and second use of batteries. **Battery Leakage:** gas generation in batteries, leakage path, leakage rates. Ruptures: Mechanical stress and pressure tolerance of cells, safety vents, Explosions: Causes of battery explosions, explosive process, **Thermal Runway:** High discharge rates, short circuits, charging and discharging. Environment and Human Health impact assessments of batteries, General recycling issues and drivers, methods of recycling of EV batteries. **(06Hrs.)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Electric and Hybrid Vehicles – Design Fundamentals	Iqbal Husain	CRC Press (2021)	Third
2.	Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	Mehrdad Ehsani, Yimin Gao, Stefano Longo, and Kambiz M. Ebrahimi	CRC Press (2018)	Third
3.	Electric Vehicle Technology Explained	Larminie, James, and John Lowry	John Wiley and Sons (2012)	Second
4.	Build Your Own Electric Vehicle	Seth Leitman and Bob Brant	McGraw-Hill Education (2013)	Third
5.	Fundamentals of Electrical Drives	G. K. Dubey	CRC Press (2002)	Second

Chairman Board of Studies
Mechanical Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-IV offered by Plastic and Polymer Engineering Department

Course Code: PPE441 Course: Open Elective-IV Packaging Technology Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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 packaging materials, processing and testing.
Objectives	To impart knowledge and skills related to packaging system for various. products, to understand the concepts of materials used in packaging, machinery in packaging and testing of packaging material.
Unit-I	**Introduction:** Packaging: history, need and evolution, elements, approach, functions of packaging, applications, elements of package design, importance of a good design, packaging hazards and their control. **(06 Hrs.)**
Unit-II	**Packaging Materials:** Selection criteria, properties and applications of plastic, paper, metal, wood and glass packaging materials, biodegradable material. **(06 Hrs.)**
Unit-III	**Packaging Forms:** Bottle, Skin, Blister, Shrink, Carton, Vacuum, Gas, CAP, MAP, tubes, corrugated containers etc. **(06 Hrs.)**
Unit-IV	**Specialty Packages:** Aseptic, tetra, types of pouches/sack; stand-up pouch, retort pouch, gusseted pouch, flexible packaging. **(06 Hrs.)**
Unit-V	**Food and Agro-based Packaging:** Requirements and their selection for raw and processed foods, meat, fish, poultry, eggs, milk and dairy products, fruits and vegetables, cereal grains and baked food products, beverages, snacks, ready to eat food, packaging of horticultural crops. Packaging of drugs and cosmetics. **(06 Hrs.)**
Unit-VI	**Printing and Packaging Quality Control:** Surface treatment, printing processes, printing inks. Criteria of packaging quality control, physical, chemical, and mechanical test procedure for packaging materials & packaged products. **(06 Hrs.)**

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

	Sr. No.	Title	Author	Publication	Edition
References	1.	Fundamentals of Packaging Technology	Soroka W.	IoPP	3rd
	2.	Understanding Plastic Packaging Technology	Susan E.M. Seleke	Hanser publications - Munich	1st
	3.	Plastics in Packaging	A.S. Althalye	Tata McGraw Hill Publishing Co. Ltd., New Delhi.	1st
	4.	Food Packaging Technology Handbook	NIIR	Asia-Pacific publication	1st
	5.	The Wiley Encyclopedia of Packaging Technology	Kit L Yam	John Wiley & Sons Inc. Publication	2009
Web links of MOOC courses	1. https://alison.com/topic/learn/87424/food-packaging-materials-and-their-properties 2. https://alison.com/careers/manufacturing/packaging-engineer				

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-V offered by Agricultural Engineering Department

Course Code: AED442 **Course: Open Elective-V** **Climate Resilient Agriculture** Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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 Understanding of Agriculture, environment, Climate etc.
Objectives	To make the learners aware of the climate change issue concerning its extent and impact. The learners will also acquire knowledge about various means to mitigate climate change impact on agriculture and allied sectors
Unit-I	**Introduction to Climate Change Science:** Basic concept of weather, climate, climate variability and climate change; Introduction to greenhouse effect (GHE), greenhouse gases (GHGs), global warming and global warming potential (GWP), Trends and fluctuations of major climatic parameters and associated environmental changes; Impact of climate change in agriculture. **(06 Hrs.)**
Unit-II	**Modern Agriculture and Climate Change**: Modern agricultural practices and sustainable production systems for food and nutritional security; Climate change scenarios in agriculture; Trends of agricultural production and productivity under the changing climatic scenarios including extreme events such as drought, flood, pest and disease outbreak. **(06 Hrs.)**
Unit-III	**Climate Change Adaptation and Mitigation**: Concept of climate change adaptation and mitigation in agriculture; analyzing and assessing climate vulnerability to identify vulnerable sectors and possible adaptation options on agriculture and allied sectors; assessing biophysical and socio-economic impacts across key sectors. **(06 Hrs.)**
Unit-IV	**Climate Resilient Agriculture**: Climate resilient agriculture (CRA) – concept, scope and importance; History of CRA; Climate-smart technologies for enhancing crop productivity and sustainability – weather smart (weather forecasts, crop diversification), water smart (rainwater harvesting, SRI, aquifer recharge). **(06 Hrs.)**
Unit-V	**Carbon smart Agriculture** (organic agriculture, conservative agriculture), nutrient and pest smart (Site Specific Nutrient Management, integrated farming systems, harnessing microbial biodiversity, ecological engineering). **(06 Hrs.)**
Unit-VI	**Climate Smart Crop Development:** Introduction to climate-smart crops and their development; Strategies being adopted to develop climate-smart crops; selection and evaluation of climate-smart crop varieties. **(06 Hrs.)**

Chairman Board of Studies
Agricultural Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

	Sr. No.	Title	Author	Publication	Edition
References	1.	Climate-Resilient Agriculture for Ensuring Food Security	S. R. Verma and P. K. Singh	Springer	1st
	2.	Climate Resilient Agriculture	R. S. Paroda, R. K. Malik, and S. R. Sharma	Agrobios	1st
	3.	Climate Resilient Horticulture: Adaptation and Mitigation Strategies	S. K. Upadhyay, A. K. Singh, and S. K. Singh	New India Publishing Agency	1st

Chairman Board of Studies
Agricultural Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-V offered by Civil Engineering Department

Course Code: CED442 **Course: Open Elective-V** **Smart City Planning and Management** Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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 Understanding of Agriculture, environment, Climate etc.
Objectives	To make the learners aware of the climate change issue concerning its extent and impact. The learners will also acquire knowledge about various means to mitigate climate change impact on agriculture and allied sectors
Unit-I	**Introduction to Smart Cities:** Definition, Concept, Need and importance, Benefits of smart cities, History of Smart city in India, Features & components of a smart city, Characteristics of smart cities, Smart structures and their Classification. Challenges faced in developing smart cities, Scope of smart cities, Worldwide Policies for Smart City. Government of India: India "100 Smart Cities" Policy and Mission, Smart Cities in India, Case Studies of Smart City. **(06 Hrs.)**
Unit-II	**Planning for Urban Infrastructure Urban Infrastructure:** Role of Planner in the provision of urban networks and services, feasibility studies for infrastructure projects, planning for major infrastructure projects, Various Infrastructure Programmes and policies by MOUD, PPP (DBOOT, BOOT, etc.) in infrastructure projects. **(06 Hrs.)**
Unit-III	**Infrastructure Management System:** Infrastructure Management in India, Challenges, Objectives, Various types of Infrastructure Services, Applications for Existing Smart City. **(06 Hrs.)**
Unit-IV	**Planning and Management of Smart Cities:** Dimension of Smart Cities, Smart Construction, Planning & Design, Theory and principles, Sustainable Building- Housing, Introduction to Green Buildings, Features of green building rating systems in India: LEED, GRIHA, Energy Saving System, Solar Energy for Smart City, Project Management. **(06 Hrs.)**
Unit-V	**Water Supply and Sanitation in Smart Cities:** Water– sources of water, treatment and storage, transportation and distribution, distribution losses, water harvesting, recycling and reuse, planning provisions, and management issues. Computer applications – Appurtenances –sensor-based Leak detection. Municipal and other waste generation, typology, quantity, collection, storage, transportation, treatment, disposal, recycling and reuse, wealth from waste, norms, and standards, institutional arrangements, planning provisions, and management issues. **(06 Hrs)**
Unit-VI	**Transportation System:** Transportation System Management in Smart Cities: Smart Vehicles and Fuels, Intelligent Transportation System: Weigh–in motion, Variable Message

Chairman Board of Studies
Civil Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

	Signs, GIS, GPS, Navigation System, Traffic Safety Management, Mobility Services, E-Ticketing etc. (06 Hrs.)

References

Sr. No.	Title	Author	Publication	Edition
1.	A city for all: valuing differences and working with diversity	Jo Beall	Zed books limited, London	1997
2.	Inclusive and sustainable urban planning: a guide for municipalities Volume 3: Urban Development Planning	UN-Habitat	United Nations	2007
3.	Insights into inclusive growth, employment and wellbeing in India	Arup Mitra	Springer	2013
4.	Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development	Ministry of Urban Development	Government of India - Ministry of Urban Development	2014
5.	The Smart Enough City: Putting Technology in Its Place to Reclaim Our Urban Future	Ben Green	MIT Press	2019

Chairman Board of Studies
Civil Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-V offered by Computer Science and Engineering Department

Course Code: CSE442 Course: Open Elective-V E-Commerce Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Business Knowledge, Market research, Digital Marketing
Objectives	1. To understand information systems for business and management 2. To understand the technical foundation for understanding information systems
Unit-I	**E-commerce and its Technological Aspects:** Overview of developments in Information Technology and Defining E-Commerce: The scope of E-commerce, Electronic Market, Electronic Data Interchange, Internet Commerce, Benefits, and limitations of E-Commerce, Produce a generic framework for E-Commerce, Architectural framework of Electronic Commerce, Web based E-Commerce Architecture. **(06 Hrs.)**
Unit-II	**Consumer Oriented E-Commerce E-Retailing:** Traditional retailing and e-retailing, Benefits of e retailing, Key success factors, Models of e-retailing, Features of e retailing. E services: Categories of e-services, Web-enabled services, match making services, Information-selling on the web, e-entertainment, Auctions and other specialized services. Business to Business Electronic Commerce. **(06 Hrs.)**
Unit-III	**Electronic Data Interchange:** Benefits of EDI, EDI technology, EDI standards, EDI communications, EDI Implementation, EDI Agreements, EDI Security. Electronic Payment Systems. **(06 Hrs.)**
Unit-IV	**Electronic Payment System:** Study and examine the use of the Electronic Payment system and the protocols used, Study Electronic Fund Transfer and secure electronic transaction protocol for credit card payment. Digital economy: Identify the methods of payments on the net – Electronic Cash, cheques and credit cards on the Internet. **(06 Hrs.)**
Unit-V	**Security in E-Commerce Threats in Computer Systems:** Virus, Cyber Crime Network Security: Encryption, Protecting Web Server with a Firewall, Firewall and the Security Policy, Network Firewalls and Application Firewalls, Proxy Server. **(06 Hrs.)**
Unit-VI	**Issues in E-Commerce:** Understanding Ethical, Social and Political issues in E-Commerce: A model for Organizing the issues, Basic Ethical Concepts, Analyzing Ethical Dilemmas, Candidate Ethical principles Privacy and Information Rights: Information collected at E-Commerce Websites, The Concept of Privacy, Legal protections Intellectual Property Rights: Types of Intellectual Property protection, Governance. **(06 Hrs)**

Chairman Board of Studies
Computer Science & Engineering
MIT Aurangabad
(An Autonomous Institute)

	Sr. No.	Title	Author	Publication	Edition
References	1.	Electronic Commerce	Elias. M. Awad	Prentice-Hall of India Pvt Ltd.	--
	2.	Electronic Commerce-A Manager's guide	Ravi Kalakota, Andrew B. Whinston	Addison-Wesley.	--
	3.	Electronic Commerce--A Managerial Perspective	Efraim Turban, Jae Lee, David King, H. Michael Chung	Addison-Wesley.	--
	4.	Electronic Commerce from Vision to Fulfilment	Elias M Award	Pearson Education.	3rd

Chairman Board of Studies
Computer Science & Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-V offered by Electronics and Computer Engineering Department

Course Code: ECE442 **Course: Open Elective-V** **Electronic Waste Management** Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Knowledge of Reduce, Reuse and Reuse
Objectives	1. To understand the scenario of E-waste 2. To discuss key elements of E-waste management 3. To understand key terms related to E-waste 4. To reduce the adverse effects of waste on human health, the environment, planetary resources, and aesthetics. The aim of waste management is to reduce the dangerous effects of such waste on the environment and human health.
Unit-I	**Introduction to E-Waste:** What is E-Waste, Indian and global scenario of e-Waste, Growth of Electrical and Electronics industry in India, E-waste generation in India, Composition of e-waste, E-waste pollutants, Possible hazardous substances present in e-waste, Environmental and Health implications. Concept of E-waste management. **(06 Hrs)**
Unit-II	**E-Waste Legislation:** Regulatory regime for e-waste in India, The Hazardous Waste (Management and Handling) Rules 2003, E-waste Management Rules 2015, Regulatory compliance including roles and responsibility of different stakeholders – producer, manufacturer, consumer, etc., Proposed reduction in the use of hazardous substances (RoHS), Extended producer responsibility (EPR). Estimation and recycling of E-waste in metro cities of India. **(06 Hrs)**
Unit-III	**E-Waste Control Measures:** Historic methods of waste disposal – dumping, burning, landfill; Recycling and recovery technologies – sorting, crushing, separation; Life cycle assessment of a product – introduction; Case study – optimal planning for computer waste. **(06 Hrs)**
Unit-IV	**Environmentally Sound E-Waste Management:** Emerging recycling and recovery technologies, Guidelines for environmentally sound management of e-waste, Guidelines for establishment of integrated e-waste recycling and treatment facility, Case studies and unique initiatives from around the world. **(06 Hrs)**
Unit-V	**E-waste Awareness and Consumer Behavior:** Importance of raising awareness about e-waste among consumers, Strategies for promoting responsible consumption and disposal of electronic products, Education campaigns and outreach programs on e-waste management. **(06 Hrs)**
Unit-VI	**E-Waste Management in Developing Countries:** Challenges and opportunities in managing e-waste in developing countries, Informal e-waste recycling sectors and their

Chairman Board of Studies
Electronics & Computer Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

	socio-economic impacts, international cooperation and capacity building for e-waste management in developing regions. **(06 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	E-waste: implications, regulations, and management in India and current global best practices	Rakesh Johri	TERI Press, New Delhi	2008
2.	Electronic Waste Management	Hester R.E., and Harrison R.M	Science	2009
3	Electronic Waste –(Toxicology and Public Health Issues)	Fowler B	Elsevier	1st (2017)
4.	Electronic Waste Management: Definition, Challenges, and Opportunities	Klaus Hieronymi	Springer, 2018	1st
5.	E-Waste Management: Research, Technology and Applications	AnshuPriya, Shri Ram, and Rajeev Kumar Mishra	CRC Press, 2019	1st
6.	E-Resources: https://news.mit.edu/2013/ewaste-mit https://archive.nptel.ac.in/courses/105/105/105105169/#			

Chairman Board of Studies
Electronics & Computer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-V offered by Electrical Engineering Department

Course Code: ECE442 Course: Open Elective-V Photovoltaic System Design Teaching Scheme: Theory- 3 Hrs./week	Credits: 3-0-0 Mid-Semester Examination-I: 15 Marks Mid-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	Solar Trajectory, Basic Electrical engineering, Basic Electronics Engineering
Objectives	The objective of the course is: 1. To develop a comprehensive technological understanding in solar PV system components 2. To provide an in-depth understanding of design parameters to help design and simulate the performance of a solar PV power plant 3. To pertain knowledge about planning, project implementation, and operation of solar PV power generation.
Unit-I	**Renewable Sources of Energy:** Grid-Supplied Electricity, Distributed Generation-Renewable. Various non-conventional energy resources; Introduction, availability, classification, relative merits and demerits. Energy Policy and Regulations. **(05 Hrs)**
Unit-II	**Introduction to Solar Power:** Discussion of Fundamentals The Diode: Description of diode, Operation Principle of Diode, E-I characteristic of diode, Forward- Biased Diode, Reverse- Biased Diode. Solar panel: photovoltaic cell, Module and Panel, I-V and P-V characteristic of PV cell, electric power output, irradiance, Standard Test Conditions. **(06 Hrs)**
Unit-III	**Effect of Atmospheric Condition and Module Formation:** Effect of Temperature on the output voltage, current and Power of PV Panel, Open Circuit Voltage and Short Circuit Current of PV Module, Fill factor, Solar Array and module:- Identical cells in series and parallel, Load line, non identical cells in series and parallel, interconnection of modules in series and parallel. **(06 Hrs)**
Unit-IV	**Energy from Sun:** Insolation and irradiance, Insolation variation with time of day, Earth-centric viewpoint and declination, Solar geometry, Insolation on a horizontal flat plate, Energy on a horizontal flat plate, Sunrise and sunset hour angles. Energy on a tilted flat plate, Atmospheric effects on tilted plates, airmass, Energy with atmospheric effects, Clearness index **(07 Hrs)**
Unit-V	**Sizing of PV for applications without batteries:** Battery capacity, C-rate, efficiency, energy and power density, battery selection, load profile for PV System design, Days of autonomy and recharge, battery and PV array size. **(06 Hrs)**

Chairman Board of Studies
Electrical Engineering
MIT Aurangabad
(An Autonomous Institute)

Unit-VI	**MPPT:** Input impedance of DC-DC converters - Boost converter Battery interfaces - battery connection, Charge controller, Understanding current control, Battery charger - slope compensation, Batteries in series and parallel - charge equalization. **(06 Hrs)**

	Sr. No.	Title	Author	Publication	Edition
References	1.	Introduction To Photovoltaic System Design	John R. Balfour , Jones and Bartlett	Jones and Bartlett	1st
	2.	Solar PV System: Design, Installation, Operation and Maintenance	L. Ashok Kumar and L Mohana Sundaram	Nova Science Publishers	1st
	3	NPTEL Course on Design of Solar Photovoltaics	Prof. L. Umanad	NPTEL	-

Chairman Board of Studies
Electrical Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-V offered by Emerging Science and Technology Department

Course Code: AID442 **Course: Open Elective-V** **Social Media Analytics** Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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 understanding of digital media concepts and Artificial Intelligence
Objectives	1. To explore the intersection of Artificial Intelligence and digital media technologies. 2. To understand the applications of AI techniques in content creation, analysis, and distribution in digital media. 3. To analyze the impact of AI on user experience, personalization, and content recommendation in digital media platforms.
Unit-I	**Introduction to Social Media Analytics:** Overview of Social Media Platforms and Data, Importance of Social Media Analytics in Business and Marketing, Challenges and Opportunities in Analyzing Social Media Data. **(06 Hrs)**
Unit-II	**Social Media Data Collection and Preprocessing:** Methods for Collecting Social Media Data: APIs, Scraping, Streaming, Data Preprocessing Techniques: Cleaning, Tokenization, Normalization, Handling Text, Image, and Video Data in Social Media Analytics. **(06 Hrs)**
Unit-III	**AI Techniques for Social Media Analytics:** Natural Language Processing (NLP) for Text Analysis, Computer Vision for Image and Video Analysis, Machine Learning Models for Predictive Analytics. **(06 Hrs)**
Unit-IV	**Social Media Marketing and Campaign Analysis:** AI-driven Social Media Marketing Strategies, Analyzing Social Media Campaign Performance, Identifying Trends and Insights for Marketing Optimization. **(06 Hrs)**
Unit-V	**Sentiment Analysis and Opinion Mining:** Understanding Sentiment Analysis Techniques, Sentiment Analysis Applications in Social Media, Opinion Mining and Topic Modeling in Social Media Data. **(06 Hrs)**
Unit-VI	**Advanced Applications and Future Trends:** Social Network Analysis and Community Detection, Deep Learning Techniques for Social Media Analytics, Emerging Trends in AI-driven Social Media Analytics. **(06 Hrs)**

Chairman Board of Studies
Computer Science & Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

	Sr. No.	Title	Author	Publication	Edition
References	1.	Social Media Analytics: Techniques and Insights for Extracting Business Value Out of social media	Marshall Sponder	McGraw-Hill Education	2014
	2.	Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Instagram, GitHub, and More	Matthew A. Russell	O'Reilly Media	3rd
	3.	Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit	Steven Bird, Ewan Klein, and Edward Loper	O'Reilly Media	2009

Chairman Board of Studies
Computer Science & Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-V offered by Mechanical Engineering Department

Course Code: MED442 **Course: Open Elective-V** **Management Techniques** Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Knowledge of basic concepts of manufacturing processes
Objectives	1. To understand the concepts of modern management to enhance creativity 2. To understand the significance of TPM & SCM
Unit-I	**Value Engineering:** Value types, Value Analysis, Value Engineering, Value Control, FAST analysis. **(04Hrs)**
Unit-II	**Supply Chain Management:** Introduction, Decision Phases in Supply Chain, Process view of a supply chain importance of supply Chain Flows. New Customer –Supplier relationship –Supplier selection, purchasing, JIT in Supply Chain, E-Business and the Supplier Chain. **(06Hrs)**
Unit-III	**Methods Engineering:** Continuous method improvement, waste, type of waste elimination. KAIZEN Improvement versus Innovation, Finding & Implementing improvements-PDCA cycle, Five -Why Process. Process Reengineering. Ensuring the Correct method of working POKAYOKE. Workplace layout & workstation design, single-minute exchange of dies, material handling system. **(08 Hrs)**
Unit-IV	**Lean Manufacturing:** Introduction Definition, distinctive features, mall-lot Production, setup- time Reduction, Maintaining and Improving Equipment. Pull production system. Focused factories and group technology, work cells and Cellular Manufacturing Standard Operation. **(06 Hrs)**
Unit-V	**Total Productive Maintenance**: Introduction, Definition, Distinctive features, Four developments striving for overall equipment effectiveness, the five TPM development activities the twelve steps of TPM, stages of TPM development. **(06 Hrs)**
Unit-VI	**Management Information System Data,** Information, Needs of computer based introduction system Definition & concept of MIS and Data processing, need of database, Role of MIS in the organization, Impact of MIS on function of the organization. **(06 Hrs)**

Chairman Board of Studies
Mechanical Engineering
MIT Aurangabad
(An Autonomous Institute)

	Sr. No.	Title	Author	Publication	Edition
References	1	Industrial Engineering & Production Management	Maratand Telsang	S. Chand	2018
	2	Techniques of Value Analysis & Engineering	L.D. Miles	Kindle edition	3rd Edition
	3	Kaizen	Masaaki Imai	----	1988
	4	Pokayoke	Hiroyuki Hirmaao	Productivity Press, Cambridge	----
	5	Management Information System	W.S. Jawadekar	TMH	6th Edition
	6	Supply Chain Management	Sunil Chopra,Peter Meindl	Pearson Education	3rd Edition
	7	Competitive Manufacturing management	John M.Nicholas	TMH	Sep
	8	Management Information System, Conceptual foundation, Structure & Development	Garden Bdevis & Margrath H.Olson.MGH	----	----
	9	Industrial Engineering & Production & Operations Management	Sanjay S.Patil Nanadkumar Hukeri	Electrotech Publications	3rd Edition
Additional References	1. https://onlinecourses.nptel.ac.in/noc21_ge20/preview 2. https://onlinecourses.nptel.ac.in/noc22_cs97/preview 3. https://onlinecourses.nptel.ac.in/noc22_cs89/preview 4. https://onlinecourses.nptel.ac.in/noc22_cs73/preview				

Chairman Board of Studies
Mechanical Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

Faculty of Science & Technology
Syllabus of Final Year B. Tech (All Branches) (Semester VII)
Open Elective-V offered by Plastic and Polymer Engineering Department

Course Code: PPE442 Course: Open Elective-V Specialty Polymers Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** Mid-Semester Examination-I: 15 Marks Mid-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	Nil
Objectives	1. To familiarize the students with specific classes of advanced polymers. 2. To study the structure-property and relationship of specialty polymers. 3. To study the applications of specialty polymers.
Unit-I	**Liquid Crystalline Polymers:** Concept of liquid crystalline phase, liquid crystalline polymers and their classification. Theories of liquid crystallinity, characteristics of LC state and LCPs, synthesis, structure-property relationship, blends of LCP, self-reinforced composites, applications of LCPs. **(06Hrs)**
Unit-II	**Conducting Polymers:** Classification of conducting polymers, theory of conduction, semiconductors and conducting polymers, band theory, requirements for polymer to work as conductor, types of conducting polymers-intrinsic and extrinsic, doping of polymer systems, synthesis, processing and testing of conducting polymers, applications of conducting polymers. **(06Hrs)**
Unit-III	**Heat Resistant Polymers:** Requirements for heat resistance, synthesis, structure, property and relationship of heat resistant polymers, application of heat resistant polymers like polyamides, and its derivatives and engineering plastic blends. **(06 Hrs)**
Unit-IV	**Photosensitive Polymers and Polymers as Coating Additives:** Photosensitive polymers synthesis, curing reactions, application in various fields, water soluble polymers, polymers as coating additives - types, synthesis, requirements for polymer to work as coating additives and applications. **(06 Hrs)**
Unit-V	**Biopolymers and Biomaterials:** Study of natural biopolymers and synthetic biopolymers and their applications like bioassays, biocatalysts etc., need of biomaterials and biopolymers, biodegradation, environmental impact, biomaterials and their medical applications, orthopedic applications. **(06 Hrs)**
Unit-VI	**Polymers in Miscellaneous Specialty Applications Information:** Polymers in agricultural applications, polymers in automobile, aerospace, light emitting polymers, polymers for ion exchange resins and membranes. **(06 Hrs)**

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

	Sr. No.	Title	Author	Publication	Edition
References	1.	Recent Advances in Liquid Crystalline Polymers	L. Lawrence Chapoy	Elsevier, New York	1st
	2.	Engineering Polymers	R.W. Dyson	Chapman and Hall, New York	1st
	3.	Polymers for High Technology Electronics and Photonics	M.J. Bowden and S.R. Turner	American Chemical Society	1st

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology Syllabus of Final Year B. Tech (Plastic and Polymer Engineering) (Semester VII)	
Course Code: PPE421 Course: Lab-I: CAE for Plastics Teaching Scheme: Practical- 2 Hrs./week	**Credits: 0-0-1** Teacher Assessment: 25 Marks

Prerequisite	Basics of injection moulding, polymeric materials, mould and product design basics.
Objectives	1. To learn basics of mould flow analysis software. 2. To understand the material flow pattern in the mould. 3. To get the knowledge of materials behaviour upon mould filling. 4. To understand the packing, cooling and warping analysis.
List of Experiment	1. Introduction to CAE for Plastics and software start-up with user interface. 2. To practice fill analysis for given plastics product for single cavity mould. 3. To practice fill analysis for given plastics product for multi cavity mould. 4. To practice packing analysis for given plastics product for single cavity mould. 5. To practice packing analysis for given plastics product for multi cavity mould. 6. To practice cooling analysis for given plastics product for single cavity mould. 7. To practice cooling analysis for given plastics product for multi cavity mould. 8. To practice warping analysis for given plastics product for single cavity mould. 9. To practice warping analysis for given plastics product for multi cavity mould. 10. To create a report based on analysis results. **At least any 8 experiments from the above-mentioned list of experiments should be performed.**

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology Syllabus of Final Year B. Tech (Plastic and Polymer Engineering) (Semester VII)	
Course Code: PPE422 **Course: Lab-II: Chemical Engineering Laboratory** Teaching Scheme: Practical- 2 Hrs./week	**Credits: 0-0-1** Teacher Assessment: 25 Marks

Prerequisite	Students should be able to understand fundamentals of Mass Transfer and Polymer Reaction Engineering.
Objectives	1. To understand the fundamental concepts of mass transfer principles and apply these concepts to real engineering problems. 2. To study the order and kinetics of various chemical reactions.
List of Experiment	1. Determination of diffusivity of volatile liquid vapor into air. 2. Determination of mass transfer coefficient of naphthalene balls in air. 3. Verification of Rayleigh's equation for differential distillation. 4. Determination of mass transfer coefficient in gas absorption column. 5. Determination of rate of drying in batch dryer. 6. To study the zero order reaction. 7. To study the hydrolysis of an ester in presence of hydrochloric acid. 8. To determine energy of activation of the reaction. 9. Residence time distribution of CSTR. 10. Residence time distribution of PFR. **At least any 8 experiments from the above-mentioned list of experiments should be performed.**

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology Syllabus of Final Year B. Tech (Plastic and Polymer Engineering) (Semester VII)	
Course Code: PPE423 **Course: Major Project-II** Teaching Scheme: Practical- 8 Hrs./week	**Credits: 0-0-4** Teacher Assessment: 50 Marks End Semester Oral Examination: 50 Marks
Objectives	This is a continuation of work in Major Project identified in semester VI, which may be discipline-specific/Interdisciplinary/Multi-disciplinary. The objective already defined is to solve a real life societal problem through research based approaches.
Course Outcome	Upon the completion of this course the students will be able to: ▪ CO1: Demonstrate proficiency in applying theoretical knowledge and practical skills acquired throughout the undergraduate program to solve real-world engineering problems. ▪ CO2: Design, implement, and evaluate a comprehensive engineering project within the domain of **Major Discipline of engineering**. ▪ CO3: Effectively communicate project objectives, methodologies, findings, and conclusions through written reports and oral presentations. ▪ CO4: Collaborate with peers, faculty supervisors, and external stakeholders to successfully complete the project within the stipulated timeframe. ▪ CO5: Reflect on the project experience, identifying strengths, weaknesses, lessons learned, and areas for future improvement.
Guidelines for Students	1. Students has already formed their project team for the identified Major Project-I. The same team will continue the next phase of the project. 2. Project Identification: Students has to continue the work on the identified project topic in consultation with faculty members, considering problem statement, and academic requirements/ relevance. 3. Project Planning: Develop a detailed project plan outlining objectives, deliverables, timeline, resources required, and milestones. 4. Implementation: Execute the project plan systematically, adhering to best practices in engineering design, development, and testing. 5. Documentation: Maintain comprehensive documentation throughout the project lifecycle, including design documents, code repositories, test reports, and meeting minutes in the project diary. 6. Communication: Regularly communicate with the faculty supervisor to provide progress updates, seek guidance on technical challenges, and solicit feedback. 7. Presentation: Prepare and deliver a final project presentation summarizing key project milestones, methodologies, results, and conclusions.
Guidelines for Faculty Supervisors	1. Mentorship: Provide ongoing mentorship and guidance to students throughout the project lifecycle, addressing technical issues, clarifying concepts, and fostering critical thinking. 2. Feedback: Offer constructive feedback on project plans, design documents, implementation strategies, and presentation skills to facilitate continuous improvement. 3. Assessment: Evaluate student progress based on predefined criteria such as project scope, quality of deliverables, adherence to timelines, and collaboration with team

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

	members. 4. Support: Facilitate access to resources, equipment, software tools, and industry contacts to enhance the quality and impact of the project. 5. Project Completion: Acquaint the students to complete the project in the timeline as per the academic calendar.
Evaluation Strategies	1. Interim Progress Evaluation: Review interim progress reports, presentations, and demonstrations to evaluate adherence to project timelines, achievement of milestones, and technical proficiency as per the academic calendar. All projects will be internally evaluated at least twice in a semester. A departmental committee shall conduct the review of the students. 2. **Teachers' Assessment**: Rubrics should be formed to evaluate each progress review for 50 marks. **The sample rubrics are given below**. Two reviews will carry 100 marks. These 100 marks are to be converted to **50 Marks** as TA marks. 3. **ESE/ Oral Examination** / Final Project Evaluation: Evaluate the final project deliverables based on predefined criteria, including technical accuracy, innovation, functionality, usability, and overall project management. It will carry **50 Marks.** It should be evaluated based on the following: a) Presentation Evaluation: Assess the effectiveness of the final project presentation in communicating project objectives, methodologies, findings, and conclusions to a diverse audience. b) Demonstration: Hardware Prototype/ Software/ Simulation demonstration should be conducted c) Project Report: Quality and the technical writing skills of the submitted project report in the hard copy format.
Typical Initial Pages & Chapters in the Final Project Report	1. Title Page: Include the project title, student names, faculty supervisor name, department, institute name, and Academic Year. 2. Table of Contents: Provide a list of all sections and subsections with corresponding page numbers. 3. Abstract: Summarize the project objectives, methodologies, findings, and conclusions in 150-200 words. 4. Introduction: Provide background information, problem statement, objectives, and significance of the project. 5. Literature Review: Review relevant literature, existing solutions, and state-of-the-art technologies related to the project domain. 6. Methodology: Describe the project methodology, including design principles, implementation strategies, and testing procedures. 7. Experimentation, Results and Discussion: Present and analyze the project results, including experimental data, simulations, prototypes, and performance metrics. 8. Conclusion and Future Scope: Summarize the key findings, contributions, limitations, and future directions of the project. 9. References: Cite all sources referenced in the report using a consistent citation style (e.g., IEEE, APA). 10. Appendices: Include supplementary materials such as code snippets, circuit diagrams, user manuals, and raw data.

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

Suggestive Rubrics

Teacher Assessment (TA) Marks						
	First Review			Second Review		
Review Panel /Examiners	Presentation	Project /Model /Simulation Readiness/ Progress	Total	Presentation	Project /Model /Simulation Readiness/ Progress	Total
	10	15	25	10	15	25
Guide/ Supervisor	Logbook	Project Progress & Teamwork		Logbook	Final draft copy of Report	
	10	15	25	10	15	25
Total	**20**	**30**	**50**	**20**	**30**	**50**

Guidelines for preparing the Final Project Report

Students and Faculty Supervisor/Guide should note the following guidelines while submitting the Project Report.

Points:

1. Paper Size: A4

Margins: Top: 1" , Bottom: 1" , Left: 1.25", Right: 1"
Gutter Position: Left, Line Spacing: 1.5
Paragraph Starting Spacing: 1 Tab

2. **Font: Times New Roman**

Chapter Heading: 14 (Upper Case, Bold)
Main titles: 12 (Upper Case, Bold)
Sub-titles: 12 (Title case, bold)
Text matter: 12

3. The **sequence** of initial pages and chapters should be as follows:

Sr. No.	Title	Page No.
i	Title Sheet	---
ii	Certificate	---
iii	Acknowledgement	---
vi	Sponsorship Letter(If Possible)	---
vii	Project Photograph	---
viii	Abstract	---
viii	Index	---
ix	List of Figures	---
x	List of Tables	---
xi	List of Graphs	---
xii	Abbreviations	---
01	Introduction	1-5
	1.1 ----	2
	1.2 ----	3
	1.2.1 ----	4
02	Literature Survey	8 - 10
	2.1 ----	8
	2.2 ----	9
03	Problem Definition	11 - 15
	3.1 ---	
	3.2 ---	

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

04	Remaining Chapters (eg. Design) Experimentation, Methodology, Analysis)	----
07	Conclusion and Future Scope	----
08	References	----
09	Appendix	----

List of Figures in following format

Figure No	Title of Figure
1.1	
2.1	

List of Tables in following format

Table No	Title of Table
2.1	
3.1	

List of Graphs in following format

Graph No	Title of Graph
5.1	
6.1	

4. **References** should be in the following format

For Research Papers :- (min. 10)

Name of Author, "Title of paper", 'Name of Journal', Year of Publication, Vol No., Paper no., Page No,

Example:

For Research Papers :-

Sreenath A. V. and Venkatesh S., "Piston Ring Lubrication in I.C. Engines", 'Journal of Tribology', 1972, Vol No. 12, Paper No-TA96507, PP 205-212.

For Books :-

Name of Author, "Title of Book", Name of Publisher, Vol. No., Year of Publication, Page no.

For Books :-

Singiresu S. Rao, "The FEM in Engineering", BH Publication, 3rd Edition, 1998, PP 22-30.

(WEB References Should Not be Written in the Reference List).

The sequence of the references should be as per the use in the report and the references should be indicated in the report in the superscript format in square bracket after the title heading of the particular topic where that reference is being used.

Example :-

2.2 A detailed about the Circuit Parameters and Analysis[2] --------

5. Figures should be on separate pages as far as possible.
6. Page no. should be mentioned at the bottom & center of the page.
7. Figure title should be mentioned below the figure in **Title Case** (12 TNR, bold) & title for table, chart, graph should be mentioned **on the top** (12 TNR, bold).
8. Report Copies: Student should prepare report copies as follows: one copy is to be retained with each student, one copy for Guide and one copy to be submitted in the department.
9. Project report hard copy should be in hard bound.
10. Presentation and Soft copy of Report should be in mailed to Guide.

Semester-VIII
Detail Course Curriculum

Final Year B. Tech Syllabus
(Plastic and Polymer Engineering)

(Autonomous Pattern Curriculum)

WEF AY 2024-25

Master Copy

This page is intentionally left blank

Faculty of Science & Technology
Syllabus of Final Year B. Tech (Plastic and Polymer Engineering) (Semester VIII)

Course Code: INT471 **Course: Internship** Teaching Scheme: -----	**Credits: 0-0-18** Teacher Assessment: 200 Marks End Semester Oral Examination: 350 Marks

1. Rationale:

Students must actively engage with the practical side of their learning as part of a holistic education to further improve their employability. The techniques and processes of production of goods and services do not demand only technical skills, but also a cluster or conglomerate of skills. A significant part of which is related to the total humanistic growth of the man. Such conglomerate skills technical and humanistic cannot obviously be acquired through pure academic learning of concepts in formalized and institutional courses and in isolation of the actual work situation. It, therefore, naturally follows that no technical education will be complete till it has two components, one learning of concepts vis a vis acquiring conceptual skill and other application of the concepts in real work situation visa vis acquiring manipulative or practicing skills. Technical education needs to have a complement of learning of the techniques of applying the concepts within the industry and business.

2. Objectives:

- The students of B. Tech course shall get an opportunity to work on industrial operations and problems.
- He / She shall apply learning concepts in the real work situation.
- He / She shall get an exposure to the industrial environment and thereby enable himself / herself to appreciate the other related aspects of industry viz. human, economic, commercial and regulatory.
- Providing opportunities to acquire and refine analytical and managerial skills crucial for a professional career.
- He / She shall identify career paths taking into account their individual strengths and aptitude.
- He / She shall contribute for the achievement of economic goals and aspirations of the industry and our country as a whole.
- Offering hands-on experience in teamwork, thereby enhancing professional skills like communication, work ethics, conflict resolution, etc., with a lasting impact on lifelong learning and professional development

3. Scope of Internship:

The student should undertake activities in consultation with the employer within the organization that will be considered as a project. This project should align with objectives but not limited to:

- Enhancing productivity
- Cost reduction
- Developing, improving, or effectively using software/systems
- Implementing energy conservation measures
- Applying process improvement techniques
- Developing applications
- Working with handling different materials
- Engaging in hardware/software projects
- Exploring agro-engineering initiatives, and other related areas.

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

4. MIT developed three models for this Internship course.

- **Model 1- Industry Internship** where students will undergo the 16 weeks internship in the particular industry.
- **Model-2 -Research Internship** where the students will do the research project in the research organization or as per the teacher's guidance.
- **Model-3- Entrepreneurial Internship** where students will go for internship preferably in the start-up.

Following are the Guidelines, evaluation strategies, and nature of internships for each of the three models:

Model 1: Industry Internship

Guidelines:

1. Students will undergo a 16-week internship in a specific industry related to their field of study.
2. The internship should provide hands-on experience in real-world industrial practices and processes.
3. Students are expected to apply theoretical knowledge gained during their academic studies to solve industrial problems.
4. Regular supervision and mentorship should be provided by both the industry mentor and a faculty supervisor from the institute.

Evaluation Strategies:

1. Internship Report: Students will submit a detailed report highlighting their internship experience, tasks performed, challenges faced, and lessons learned.
2. Industry Feedback: The industry mentor will provide feedback on the student's performance, including their ability to adapt to the work environment, teamwork, problem-solving skills, and professional conduct.
3. Presentation: Students will deliver a presentation summarizing their internship experience to faculty members and peers as a part of internship review.

Nature of Internship:

1. Practical Exposure: Students will gain practical experience by working on real projects and tasks within the industry.
2. Skill Development: The internship will focus on enhancing students' technical skills, communication skills, teamwork, and problem-solving abilities.
3. Networking Opportunities: Students will have the chance to build professional connections within the industry, potentially leading to future employment opportunities.
4. Industry Insights: The internship will provide valuable insights into the day-to-day operations, challenges, and opportunities within the chosen industry sector.

Model 2: Research Internship

Guidelines:

1. Students will engage in a research project under the guidance of faculty members or within a research organization.
2. The research project should be aligned with the student's academic interests and career goals.
3. Students will conduct literature reviews, experimental work, data analysis, and interpretation to contribute to the research project.
4. Regular meetings with the research supervisor should be held to monitor progress and provide guidance.

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Evaluation Strategies:

1. Research Report: Students will submit a comprehensive research report detailing their project objectives, methodology, findings, and conclusions.
2. Research Presentation: Students will present their research findings to faculty members, peers, and external stakeholders as a part of internship review.
3. Research Contribution: The research supervisor will assess the student's contribution to the project in terms of originality, critical thinking, research methodology, and data analysis skills.
4. Peer Evaluation: Peers and faculty members will provide feedback on the clarity, relevance, and significance of the research work.

Nature of Internship:

1. Research Focus: Students will gain hands-on experience in conducting research, including literature review, experimental design, data collection, and analysis.
2. Critical Thinking: The internship will foster critical thinking and problem-solving skills through the exploration of research questions and hypotheses.
3. Collaboration: Students will collaborate with faculty members, research scholars, and fellow students, fostering teamwork and interdisciplinary learning.

Model 3: Entrepreneurial Internship

Guidelines:

1. Students will intern with a reputed entrepreneurial organization or startup to gain insights into entrepreneurship and innovation.
2. The internship should involve active participation in entrepreneurial activities such as business development, product/service innovation, market research, and strategic planning.
3. Students may work on specific projects or initiatives within the organization, contributing to its growth and development.
4. Mentorship and guidance should be provided by experienced entrepreneurs or business leaders.

Evaluation Strategies:

1. Business Plan: Students will develop a comprehensive business plan for a new venture or product/service innovation, outlining the market opportunity, target audience, competitive analysis, and financial projections.
2. Entrepreneurial Pitch: Students will pitch their business ideas or projects to a panel of judges, showcasing their entrepreneurial vision, creativity, and feasibility.
3. Impact Assessment: The organization mentor will evaluate the student's impact on the organization's growth, innovation, and strategic direction.
4. Reflection and Learning Journal: Students will maintain a learning journal documenting their entrepreneurial journey, including challenges faced, lessons learned, and personal growth.
5. Presentation: Students will present their internship work to faculty members, peers, and external stakeholders as a part of internship review.

Nature of Internship:

1. Entrepreneurial Exposure: Students will immerse themselves in the entrepreneurial ecosystem, gaining firsthand experience in startup culture, innovation, and risk-taking.
2. Innovation and Creativity: The internship will encourage students to think creatively, identify opportunities, and develop innovative solutions to real-world problems.
3. Business Acumen: Students will develop business acumen by participating in strategic decision-

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

making, market analysis, and business development activities.

4. Networking and Mentoring: Students will have the opportunity to network with successful entrepreneurs, investors, and industry experts, leveraging their insights and expertise for personal and professional growth.

These guidelines, evaluation strategies, and nature of internships for each model will provide students with valuable experiential learning opportunities and prepare them for future career endeavours in their chosen field.

5. The curriculum for B. Tech students of Final Year Course of Part-II shall consist of:

- Internship for a period of 16 weeks and the period of the term shall be as prescribed by the institute from time to time.
- A project on live problems of the industry shall be undertaken by the student/group of students undergoing internship in the same establishment.
- The teacher assessment shall consist of the internship record-daily diary, work diary, progress report, monthly review, a record containing the literature survey in the field of appropriate branch of Engineering, a preliminary report related to project work etc.
- Seminars will be arranged after successful completion of period specified in the scheme of semester VIII of B.Tech. The date and times will be decided according to the convenience of guide and student.

6. Period of Internship:

The period of Internship will be the period of 16 weeks for the subject under B. Tech. course semester-VIII, which will be notified by Maharashtra Institute of Technology, Chhatrapati Sambhajinagar (Aurangabad).

7. Obligation of Students:

- Student must maintain a minimum attendance of 90% of total working days for the period of Internship.
- To learn his/her subject field in Engineering or Technology consciously and diligently at his place of training.
- To carry out all orders of his/her Employer and the Superior in the establishment.
- To abide by the Rules and Regulations of the Industry/Establishment in all matters of conduct and discipline.
- To carry out the obligation under the agreement of Internship. The student shall maintain a report of his work during the period of his Internship in a proforma made available in Internship Instruction Manual.
- Except in case of extreme urgency, the B. Tech. student shall submit an application for all other leaves except the medical leave to the Manager/Gen. Manager (Personnel) of the concerned industry, where he/she is undergoing internship and obtain sanction before the leave is taken. In case of Medical Leave, he/she shall submit an application to Maharashtra Institute of Technology, Chhatrapati Sambhajinagar. The shortage in attendance will be subjected to extending the period of Internship in which case, the student may not be allowed to appear for the final internship assessment of term work etc. which will be held immediately after successful completion of the Internship.

8. Maintenance of Record:

Every student of B. Tech. course shall maintain a daily record of the work done by him/her relating to the internship available in Internship Instruction Manual.

9. Monitoring of Internship:

The B.Tech. students are expected to follow all the rules and discipline of the industry. However, because of other academic requirements and the nature of the project, the student may have to work in other places outside the industry. The faculty and Industry supervisor will work out a suitable arrangement to review the

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Master Copy

progress of the work from time to time. Maharashtra Institute of Technology, Chhatrapati Sambhajinagar will monitor the progress of internship in association with industry authority

10. Conduct and Discipline:

In all matters of the conduct and discipline, B. Tech. student shall be governed by the rules and regulations (applicable to employees of the corresponding category) in the Establishment, where he/she is undergoing internship.

11. Undertaking for the Internship:

The B.Tech. student undergoing for the Internship should provide the undertaking to the institute that institute/employing organization will not be responsible for any mishap / accident during the training period and any act contrary to law. Also, it is highly recommended to get insured by taking Accidental Insurance Policy before joining the internship for the prescribed training period.

12. Holding of Test and Grant of Certificate:

The progress in internship of every student shall be assessed by the industry and Maharashtra Institute of Technology faculty from time to time. Every B. Tech. student undergoing internship shall be issued a certificate of Proficiency on completion of his/her training to the satisfaction of the industry.

13. Practical Examination:

The Practical examination will be conducted after successful completion of the internship for which guide will be internal examiner and external examiner will be appointed by the institute. The date of practical examination will be same for the students of a branch and will be notified by the institute. The assessment of the practical examination shall consist of:

1. Internship Performance.
2. An Oral/Power point presentation on the training/project work done during internship.
3. Assessment of the teacher assessment / report.
4. There will be a monthly review of internship progress.

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

This page is intentionally left blank

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Faculty of Science & Technology
Syllabus of Final Year B. Tech (Plastic and Polymer Engineering) (Semester VIII)

Course Code: INT472 **Course: Grand Viva** Teaching Scheme: -----	**Credits: 0-0-3** End Semester Oral Examination: 100 Marks

Preamble	The "**Grand Viva**" concept is that the oral examination of the individual student will be taken at the end of final semester. In that examination a panel of examiners (Internal +External) will assess the overall performance of a student which involves careful consideration of the knowledge, skills, and aptitudes that students are expected to have acquired throughout their four years of study. The aim of the Grand Viva is to comprehensively assess the overall understanding, application, and proficiency of the students in their field of study.
Guidelines for Students	1. Student has to prepare for the Grand Viva to demonstrate his/her technical ability, personality development, and professional experience at the end of 3/4 years study. 2. An individual student's Grand Viva will be conducted 3. Start by revisiting course textbooks, lecture notes, and assignments from all four years of study. 4. Practice explaining concepts to peers or mentors to improve communication skills. 5. Conduct mock interviews or presentations to simulate the Grand Viva experience. 6. Stay updated with recent developments and trends in Electronics and Computer Engineering through reputable sources. 7. Come with your updated Resume/CV and the essential documents to support your resume/CV. 8. Come with the activity certificates/report regarding your Career Path Module (CPM), Activity Event Grade Point Scheme (AEGPS), MOOC courses, Honor/Minor Courses, EBL, PBL, Major/Minor Project, Internship/In-Plant Training, Co-curricular/Extra-Curricular like NSS, NCC, Clubs, Social activities and any other achievement/awards earned during the period of study.
Key components and guidelines for the preparation purpose to students as well as parameters for assessors/ examiners	**Components and Guidelines**: Following are some key components and guidelines that are suggested for the preparation purpose to students as well as parameters for assessors/examiners: 1. **Comprehensive Coverage**: The Grand Viva should cover all major subjects and topics studied during the four-year program. 2. **Critical Thinking and Problem-Solving**: Emphasize evaluating the student's ability to apply theoretical knowledge to practical scenarios and solve complex problems. Questions should not only test factual recall but also analytical thinking and problem-solving skills. 3. **Project Evaluation**: Students should present and discuss their project/experience (major/minor/mini/PBL/EBL/IPT/Internship projects undertaken during the course) in detail. This includes explaining the project objectives, methodology, implementation, results, and any challenges faced. The panel may assess the originality, technical competence, and innovation demonstrated in the project. 4. **In-depth Understanding of Core Concepts**: Assess the depth of understanding in

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

	fundamental principles and theories of field of his/her discipline /engineering. For example, this could involve asking questions on circuit analysis, digital logic, microprocessor architecture, operating systems, networking, control systems, etc. 5. **Application of Knowledge**: Evaluate how well students can apply theoretical concepts to real-world scenarios and engineering problems. For example, questions could focus on designing systems/circuits/mechanisms, writing algorithms, developing software applications, or optimizing systems. 6. **Communication Skills**: Assess the student's ability to communicate technical ideas effectively. This includes clarity in explaining concepts, answering questions confidently, and defending their viewpoints. 7. **Professionalism and Ethics**: Include questions on professional ethics, responsibility, and societal impact of engineering solutions. Students should demonstrate awareness of ethical considerations in engineering practice. 8. **Current Trends and Emerging Technologies**: Discuss recent advancements and trends in the field of study. This could cover topics like artificial intelligence, Internet of Things (IoT), cybersecurity, embedded systems, etc. 9. **Panel Composition**: The examination panel should ideally consist of faculty members with expertise in different areas of Electronics and Computer Engineering. There should be one internal and one external examiner for the group of 10 students. This ensures a comprehensive assessment from multiple perspectives. 10. **Preparation Guidelines**: Provide students with guidelines on how to prepare for the Grand Viva, including recommended readings, practice questions, and mock interview sessions. 11. **Assessment Criteria**: Define clear assessment criteria for grading students, considering factors such as knowledge depth, problem-solving abilities, presentation skills, and overall performance. 12. **Feedback and Reflection**: After the examination, provide constructive feedback to students to help them understand their strengths and areas for improvement. Encourage students to reflect on their academic journey and future career aspirations.

Grand Viva Assessment Rubric

A suggested rubric for assessing students during the Grand Viva is given in Annexure-I. Looking the necessity, the assessors/ evaluator panel/examiners may modify it depending upon the program scope and nature.

Using the Rubric:

- **Assessment Process**: Each examiner rates the student's performance against the defined criteria, using the rubric's levels (5 Levels) to assign scores for each criterion.
- **Scoring**: Scores from individual criteria are aggregated to calculate an overall score for each student. In the following table total 10 criterias are given. Here maximum 100 marks can be given accordingly.
- **Feedback**: Detailed feedback should be provided based on the rubric, highlighting strengths and areas for improvement.
- **Consensus**: Panel members may discuss discrepancies and reach a consensus on final scores.

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Annexure-I: Assessment Rubrics for Grand Viva Evaluation

Sr. No.	Criteria	Excellent (10-9)	Good (8-7)	Average (6-5)	Satisfactory (4-3)	Inadequate (2-1)
1.	**Depth of Understanding**	Demonstrates exceptional depth of knowledge and understanding across all topics. Can articulate complex concepts clearly and accurately.	Shows solid understanding of most topics with few gaps. Able to explain key concepts effectively.	Demonstrates basic understanding of core concepts but lacks depth in some areas.	Shows limited understanding; struggles to explain fundamental concepts adequately.	Shows poor understanding; unable to explain key concepts correctly.
2.	**Problem-Solving Skills**	Applies advanced problem-solving strategies to complex engineering challenges. Demonstrates creativity and originality in approach.	Applies appropriate problem-solving techniques to most challenges. Shows logical reasoning and analytical skills.	Applies basic problem-solving techniques but may struggle with complex problems.	Attempts problem-solving but lacks systematic approach or clear strategies.	Unable to demonstrate effective problem-solving skills.
3.	**Presentation and Communication Skills**	Communicates ideas clearly, confidently, and persuasively. Engages effectively with the panel. Uses professional language and gestures appropriately.	Communicates effectively but may lack some polish or consistency. Presents ideas coherently with minor issues in clarity or delivery.	Communicates ideas adequately but with some difficulty. Presentation may lack organization or clarity.	Communication is unclear or hesitant; struggles to convey ideas effectively. Presentation lacks profession-alism.	Communication is incoherent or insufficient; fails to convey ideas clearly or confidently.
4.	**Major/Minor/EBL /PBL/ Internship related**	Presents work done comprehensively and articulately. Clearly explains objectives, methodology, results, and conclusions. Demonstrates innovation and technical competence.	Presents work done with clarity and coherence. Provides a good overview of objectives, methodology, and outcomes. Shows technical competence.	Presents work done adequately but with some gaps or inconsistencies. May struggle to explain certain aspects clearly.	Presents work done but lacks detail or coherence. Shows limited understanding of project scope or outcomes.	Fails to present work done adequately; unable to explain objectives, methodology, or outcomes.
5.	**Critical Thinking and Analysis**	Demonstrates exceptional critical thinking skills. Formulates insightful questions and evaluates information effectively. Offers well-reasoned arguments.	Shows strong critical thinking abilities. Capable of analyzing information and drawing reasonable conclusions.	Demonstrates basic critical thinking skills but may lack depth or thoroughness in analysis.	Shows limited critical thinking; struggles to analyze information effectively.	Shows little to no critical thinking; unable to analyze information or draw meaningful conclusions.

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)

Sr. No.	Criteria	Excellent (10-9)	Good (8-7)	Average (6-5)	Satisfactory (4-3)	Inadequate (2-1)
6.	**Professionalism and Ethics**	Demonstrates a deep understanding of professional ethics and responsibilities. Shows maturity and professionalism in responses.	Shows awareness of professional ethics and responsibilities. Responses are generally appropriate and respectful.	Demonstrates basic awareness of professional ethics but may have inconsistencies or lacks maturity in responses.	Shows limited understanding of professional ethics or inappropriate behavior. Responses lack professionalism.	Shows no understanding of professional ethics; behaves inappropriately or unprofessionally.
7.	**Co-curricular and extra-curricular engagements**	Extraordinary participation and involvement	Remarkable participation and involvement	Appreciable efforts taken to participate in these activities	Satisfactory level of participation	Shows poor interest in such participation
8.	**Awareness about the recent trends in the discipline of Study**	Demonstrates very good awareness about the current trends in market/field of study	Shows good awareness about the current trends in market/field of study	Shows satisfactory awareness about the current trends in market/field of study .	Shows limited awareness about the current trends in market/field of study.	Shows little to no awareness about the current trends in market/field of study.
9.	**Vision to perceive the future goals in life**	Exhibit the strong understanding of his/her future career and life living plans	Exhibit the good understanding of his/her future career and life living plans	Exhibit the average understanding of his/her future career and life living plans	Exhibit the satisfactory understanding of his/her future career and life living plans	Unable to exhibit the about his/her future career and life living plans
10.	**Overall Performance**	Consistently exceeds expectations across all criteria. Presents a highly impressive performance.	Meets expectations across most criteria. Demonstrates a solid performance overall.	Meets minimum requirements but with notable areas for improvement. Performance is satisfactory.	Falls below expectations in several areas. Requires significant improvement.	Performance is significantly below expectations. Requires extensive improvement in multiple areas.

Chairman Board of Studies
Plastic & Polymer Engineering
MIT Aurangabad
(An Autonomous Institute)