DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.SU/Engg./B.Tech./15/2020

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies & recommended by the Dean, Faulty of Science & Technology, the Hon'ble Vice-Chancellor **has accepted revised syllabus of B.Tech. Second Year in accordance with Choice Based Credit & Grading System for all Branches as per guidelines of AICTE** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as enclosed herewith.

Sr.No.	Syllabi as per CBC & GS
[1]	B.Tech. [Civil Engineering],
[2]	B.Tech. [Mechanical Engineering],
[3]	B.Tech. [Plastic and Polymer Engineering],
[4]	B.Tech. [Electronics and Telecommunication Engineering],
[5]	B.Tech. [Electrical Engineering],
[6]	B.Tech. [Computer Science & Engineering].
[7]	B.Tech.[Agricultural Engineering]

This is effective from the Academic Year 2020-21 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.SU/2020/ 21244-52
Date:- 31-10-2020.

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Deputy Registrar,
Academic Section

Copy forwarded with compliments to :-

1] The Principals, affiliated concerned Colleges,
Dr. Babasaheb Ambedkar Marathwada University.

2] The Director, University Network & Information Centre, UNIC, with **a request to upload this Circular on University Website.**

Copy to :-

1] The Director, Board of Examinations & Evaluation,
2] The Section Officer, [Engineering Unit] Examination Branch,
3] The Programmer [Computer Unit-1] Examinations,
4] The Programmer [Computer Unit-2] Examinations,
5] The In-charge, [E-Suvidha Kendra],
6] The Public Relation Officer,
7] The Record Keeper,

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Revised Syllabus of Bachelor of Technology

Plastic and Polymer Engineering

(III & IV Semester)

Under Choice Based Credit System (CBCS)

Under Faculty of Science and Technology

(Effective from 2020-21 and onwards)

FACULTY OF SCIENCE AND TECHNOLOGY

Proposed Syllabus Structure w.e.f. 2020-2021 (Choice Based Credit System)

SY B. Tech. (Plastic and Polymer Engineering)

Semester-III

Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks							Credits			
		Theory	Practical	Tutorial	MSE-I	MSE-II	TA	ESE	TW	PR/OR	Total	TH	TW/PR	TUT	Total
BSH201	Vector and Partial Differential Equation	3	-	-	15	15	10	60	-	-	100	3	-	-	3
PPE202	Introduction to Polymer Engineering	3	-	-	15	15	10	60	-	-	100	3	-	-	3
PPE203	Organic Chemistry of Polymers	3	-	-	15	15	10	60	-	-	100	3	-	-	3
PPE204	Polymer Testing	3	-	-	15	15	10	60	-	-	100	3	-	-	3
PPE205	Physical Chemistry of Polymers	3	-	-	15	15	10	60	-	-	100	3	-	-	3
PPE221	Lab: Introduction to Polymer Engineering	-	2	-	-	-	-	-	-	25	25	-	1	-	1
PPE222	Lab: Organic Chemistry of Polymers	-	2	-	-	-	-	-	-	25	25	-	1	-	1
PPE223	Lab: Polymer Testing	-	2	-	-	-	-	-	-	25	25	-	1	-	1
PPE224	Lab: Physical Chemistry of Polymers	-	2	-	-	-	-	-	25	-	25	-	1	-	1
PPE225	Development of Skills-III (Design Lab-I)	-	2	-	-	-	-	-	-	25	25	-	1	-	1
PPE226	Lab: Mechanical Operations	-	2	-	-	-	-	-	25	-	25	-	1	-	1
		15	**12**	**-**	**75**	**75**	**50**	**300**	**50**	**100**	**650**	**15**	**6**	**-**	**21**

Semester-IV

Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks							Credits			
		Theory	Practical	Tutorial	MSE-I	MSE-II	TA	ESE	TW	PR/OR	Total	TH	TW/PR	TUT	Total
BSH251	Probability and Random Theory	3	-	-	15	15	10	60	-	-	100	3	-	-	3
PPE252	Heat Transfer	3	-	-	15	15	10	60	-	-	100	3	-	-	3
PPE253	Polymer Synthesis and Manufacturing	3	-	-	15	15	10	60	-	-	100	3	-	-	3
PPE254	Polymer Additives and Compounding	3	-	-	15	15	10	60	-	-	100	3	-	-	3
PPE291-293	Professional Elective Courses-I	3	-	-	15	15	10	60	-	-	100	3	-	-	3
PPE271	Lab: Heat Transfer	-	2	-	-	-	-	-	-	25	25	-	1	-	1
PPE272	Lab: Polymer Synthesis and Manufacturing	-	4	-	-	-	-	-	-	50	50	-	2	-	2
PPE274-76	Lab: Professional Elective Courses-I	-	2	-	-	-	-	-	25	-	25	-	1	-	1
BSH277	Development of Skills-IV (Basic Science)	-	2	-	-	-	-	-	-	25#	25	-	1	-	1
PPE278	Lab: Computer Fundamentals	-	2	-	-	-	-	-	25	-	25	-	1	-	1
BSH 803/ BSH 808	Mandatory non-credit course: Technical Writing	2													
		17	**12**	**-**	**75**	**75**	**50**	**300**	**50**	**100**	**650**	**15**	**6**	**-**	**21**
		#	Online Examination												

MSE- Mid Semester Exam, ESE- End Semester Examination, TH-Theory, OR- Oral, TA-Teacher Assessment, TW- Term Work, PR- Practical, Tut-Practical

Professional Elective Courses-I

Group A	Group B	Group C
PPE291 : Process Calculations	PPE292: Materials Engineering	PPE293: Fiber Technology

Mandatory non-credit audit course

Course code	Course	Offered by Department
BSH803	Employability Skills	Basic Sciences and Humanities
BSH804	Emotional Quotient	Basic Sciences and Humanities
BSH805	Energy Audit	Mechanical Engineering
BSH806	Cyber Security	Computer Science and Engineering

Minor and Honours Scheme is to be introduced from academic year 2020-21

- Every Department to develop and submit 'Minor-Courses-List' of 5-6 Theory courses with Titles and detailed syllabi, separately.
- Every Department to develop and submit a 'Honours-Courses-List' of 5-6 Theory courses with Titles and detailed syllabi. MOOCs are permitted to be part of the list, so also a few PG courses. Multiple Verticals are encouraged.
- The courses from main curriculum should not be in the list of the courses for Minor/Honours.
- Host Department to float the courses from Minor/ Honours-List as One/Two in each Semester (viz. 4^{th},5^{th} ,6^{th},7^{th},8^{th}semester)
- A Student opting for 'Honours' will NOT be ENTITLED to register for 'Minor'.
- As per this scheme students will get Minor Degree and Honours along with Degree (Major) which they are pursuing.
- Regular learners can complete the B. Tech. degree with 168 credits, for Brighter and interested Students opting Honours/Minor scheme, the UG program would be of 168 + 20 = 188 credits.
- The remedial assessment schemes such as Re-examination or summer term will NOT be applicable for Minor or Honors schemes. Student failing in any of the Minor or Honors courses, at any stage will be discontinued from the Scheme.

Sr. No.	**Academic Scheme**	**Description**
01	Minor Degree	Students can select courses from other branches. e.g. If Mechanical Engineering student selects courses from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with Minor degree of Civil Engineering.
02	Honours	Students can select advanced courses from their respective branch in which they are perusing the degree.

		e.g. If Mechanical Engineering student selects advanced courses from same branch under this scheme, he/she will get Major degree along with Honours of Mechanical Engineering.

- Maximum batch size for minor is 30 and for Honour, it is 1/3rd of the total intake of the respective department.

Detailed of this scheme are given below.

Minor Degree Scheme:

- Students can select courses from other branches. E.g. If Mechanical Engineering student selects courses from Civil Engineering under this scheme; he/she will get Major degree of Mechanical Engineering with Minor Degree of Civil Engineering.
- Student from ANY department is ELIGIBLE to apply for Minor degree from ANY OTHER DEPARTMENT.
- Student can select one course per semester from the list of courses of a branch of which he or she want to peruse Minor Degree.
- The Scheme will be started from second year 4th Semester of UG program.
- An applicant must have a minimum CGPA of 6.75 (up to 2nd Semester) and for Second Year Direct Admitted Diploma Students, with CGPA of 6.75 or equivalent.
- Mentor will be allotted from host departments to guide the students during his/her entire curriculum.
- Online courses may be selected from platforms like NPTEL/ edX/ Coursera/ Udacity/ Purdue Next/ Khan Academy/ QEEE/Udemy etc.
- While selecting the online course care must be take that it must be a certification course should be of 4/5 credits each as per the syllabus structure.
- Lab course/Internship/Mini-project is permitted in Minor Scheme.

Honours Scheme:

- Students can select advanced courses from their respective branch in which they are perusing the degree. e. g. If Mechanical Engineering student selects advanced courses from same branch under this scheme, he/she will get Major degree along with Honours in Mechanical Engineering.

- Students from same department are eligible for Honours.
- The Scheme will be started from second year 4thSemester of UG program.
- An applicant must have a minimum CGPA of 6.00 (up to 2nd Semester) and for Second Year Direct Admitted Diploma Students, with CGPA of 6.00 or equivalent.
- Student can select one course per semester from the list of Honor courses of a branch in which they are perusing the degree.
- Mentor will be allotted from host departments to guide the students during his/her entire curriculum.
- Online courses may be selected from platforms like NPTEL/ edX/ Coursera/ Udacity/ Purdue Next/ Khan Academy/ QEEE/Udemy etc.
- While selecting the online course care must be take that it must be a certification course should be of 4/5 credits each as per the syllabus structure.
- Lab course/Internship/Mini -project is permitted in Honours Scheme.

<table>
<tr><td colspan="3">Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of Syllabus of S. Y. B. Tech. Semester-III
(Agricultural, Plastic and Polymer, Civil and Mechanical Engineering)
(Non-Circuit Branches)</td></tr>
<tr><td colspan="2">Course Code: BSH201
Course: Vector and Partial Differential Equation
Teaching Scheme:
Theory: 3 Hrs/week</td><td>Credits: 3-0-0
Mid Semester Examination-I: 15 Marks
Mid Semester Examination-II: 15 Marks
Teacher Assessment: 10 Marks
End Semester Examination: 60 Marks
End Semester Examination (Duration): 3 Hrs</td></tr>
<tr><td>Prerequisite</td><td colspan="2">• Basic formulae of Trigonometry, Derivatives and Integration, fundamentals of Vector algebra, knowledge of multiple integrals, partial derivatives, evaluation of real integrals and odd and even function.</td></tr>
<tr><td>Objectives</td><td colspan="2">• To understand basic necessity for the foundation of Engineering & Technology.
• To enhance the mathematical skills and thinking power of students.
• To develop the ability, know the concept of Engineering mathematics and apply these to solve Engineering problem in various field.
• To apply mathematical concepts for solving the practical problem in Engineering and Technology.</td></tr>
<tr><td>Unit-I</td><td colspan="2">Linear Differential Equation (LDE) & Its Applications:
Solution of n^{th} order linear differential equation with constant coefficients: Complementary function, Particular integral- short method, method of variation of parameters, Application of LDE to Mechanical systems, Beam and shaft.
(8 Hrs)</td></tr>
<tr><td>Unit-II</td><td colspan="2">Vector Differentiation:
Differentiation of vectors, Scalar and Vector point functions, Gradient of a scalar point function, Directional derivative, Divergence and Curl of vector point function, Irrotational and Solenoidal vector fields.
(6 Hrs)</td></tr>
<tr><td>Unit-III</td><td colspan="2">Vector Integration:
Line integral, Work done by a force, Surface integral, Green’s theorem, Stokes’s theorem.
(4 Hrs)</td></tr>
<tr><td>Unit-IV</td><td colspan="2">Laplace Transform:
Definition, Laplace Transforms of elementary functions, Theorems and properties of Laplace transform (without proof): First shifting and second shifting theorem, Change of scale, Multiplication by t^n, Division by t, Laplace transform of Derivatives, Laplace transform of integral, Evaluation of integrals using Laplace</td></tr>
</table>

	transform, Laplace transform of Unit step function and Dirac's delta function, Inverse Laplace transform: Definition, Inverse Laplace transform using: i. Laplace transform table ii. Theorem and properties of Laplace transform iii. Convolution theorem Application of Laplace transform to solve linear differential equations with given initial conditions. (8 Hrs)
Unit-V	Fourier Transform: Fourier transform and inverse Fourier transform, Fourier sine and cosine transform, Inverse Fourier sine and cosine transform. (4 Hrs)
Unit-VI	Application of Partial Differential Equation: Solution of partial differential equation by method of separation of variables, Applications to i. Vibration of a string (Wave equation) (without proof) ii. One dimensional heat flow equation (Diffusion equation) (without proof) iii. Two dimensional heat flow equation (Diffusion equation) (without proof). (6 Hrs)

	Sr. No.	Title	Author	Publication	Edition
References	1.	Advanced Engineering Mathematics	Erwin Kreyszig	Wiley eastern Ltd	10^{th}
	2.	Higher Engineering Mathematics	B. V. Ramana	Tata McGraw-Hill	11^{th}
	3.	Advanced Engineering Mathematics	C. R. Wylie	McGraw Hill Publications	6^{th}
	4.	Partial Differential Equations	Fritz John	Springer	4^{th}
	5.	Thomas' Calculus	Maurice D. Weir, Joel Hass, Frank R. Giordano	Pearson Education	12^{th}
	6.	Applied Mathematics	P. N. Wartikar, J. N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune	9^{th}
	7.	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publishers	46^{th}
	8.	Advanced Engineering Mathematics	H. K. Dass	S. Chand and Co. Ltd	18^{th}
Online course related video	9.	NPTEL, Swyam, edX, Coursera, Khan Academy etc.			

<table>
<tr><td colspan="3">Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-III</td></tr>
<tr><td colspan="2">Course Code: PPE202
Course: Introduction to Polymer Engineering
Teaching Scheme:
Theory: 3 Hrs/week</td><td>Credits: 3-0-0
Mid Semester Examination-I: 15 Marks
Mid Semester Examination-II: 15 Marks
Teacher Assessment: 10 Marks
End Semester Examination: 60 Marks
End Semester Examination (Duration): 3 Hrs</td></tr>
<tr><td>Prerequisite</td><td colspan="2">• Fundamental knowledge of chemistry based on 10^{th} and 12^{th} standard.</td></tr>
<tr><td>Objectives</td><td colspan="2">To provide a
• General overview of polymers, their types, concept of molecular weight.
• General understanding of structure of polymers and predict polymer properties.</td></tr>
<tr><td>Unit-I</td><td colspan="2">Introduction:
Historical developments of different polymers – a general overview, basic raw materials, concepts and definitions of monomers, oligomers, macromolecules, polymers, repeating units, degree of polymerization, functionality concept, functional groups.
(2 Hrs)</td></tr>
<tr><td>Unit-II</td><td colspan="2">Classification of Polymers:
Basic concepts and definitions of: organic and inorganic; thermoplastics and thermosets; addition and condensation; natural, semisynthetic and synthetic; crystalline and amorphous; homopolymers and copolymers; homochain and heterochain; linear, branched and crosslinked.
Concept of rubber, plastic and fiber, conformation and configuration, tacticity.
Commodity and specialty polymers.
(7 Hrs)</td></tr>
<tr><td>Unit-III</td><td colspan="2">Molecular Weight: Distribution and Determination:
concept of average molecular weight of polymers ($\overline{M}_n, \overline{M}_w, \overline{M}_v$ and $\overline{M}_z$), molecular weight distribution and concept of polydispersity and monodispersity, degree of polymerization, determination of molecular weight by end group analysis, solution viscosities, size exclusion chromatography, membrane osmometry, light scattering method.
(9 Hrs)</td></tr>
</table>

Unit-IV	Mechanical and Thermal Properties: Effect of crystallinity, molecular weight, cross link density and additives on modulus of elasticity, tensile strength, flexural strength, impact strength, yield strength, fracture toughness. Transition temperature in polymers: melting temperature (T_m) and glass transition temperature (T_g), factors affecting T_m and T_g. (8 Hrs)
Unit-V	Electrical and Optical Properties: Effect of polymer structure on dielectric constant, power factor, dissipation factor, loss factor, electrical conductivity, static charges, resistivity and arc resistance of polymers. Effect of polymer structure on optical properties, viz. clarity, transparency, haze, transmittance, absorbance, gloss. (6 Hrs)
Unit-VI	Chemical Properties: Effects of polymer structure on solubility in different solvents, concept of cohesive energy and solubility parameter, chemical resistance of polymers, diffusion and permeability. (4 Hrs)

References

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

<table>
<tr><td colspan="3">Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-III</td></tr>
<tr><td colspan="2">Course Code: PPE203
Course: Organic Chemistry of Polymers
Teaching Scheme:
Theory: 3 Hrs/week</td><td>Credits: 3-0-0
Mid Semester Examination-I: 15 Marks
Mid Semester Examination-II: 15 Marks
Teacher Assessment: 10 Marks
End Semester Examination: 60 Marks
End Semester Examination (Duration): 3 Hrs</td></tr>
<tr><td>Prerequisite</td><td colspan="2">• Basics of organic chemistry.</td></tr>
<tr><td>Objectives</td><td colspan="2">• To impart an understanding of different organic materials used in preparation of different polymers.
• To teach how the organic materials are related the fundamental properties of organic chemicals, their nomenclature, different reaction mechanisms, properties and applications.</td></tr>
<tr><td>Unit-I</td><td colspan="2">Nomenclature of Organic Compounds:
Common name system and IUPAC name system of amines, nitro compounds, ketones, aldehydes, esters, carboxylic acids, ethers, halo compounds, alcohols, saturated and unsaturated hydrocarbons, R-S nomenclature (Cahn-Ingold-Prelog system), E-Z nomenclature.
(05 Hrs)</td></tr>
<tr><td>Unit-II</td><td colspan="2">Fundamentals of Chemical Bonding:
Overview of theories of chemical bonding; types of bonds (ionic, covalent, coordinate covalent, metallic bonding, hydrogen bond, Van der Waals force); bond fission, hybridization, geometry of molecules.
(05 Hrs)</td></tr>
<tr><td>Unit-III</td><td colspan="2">Fundamentals of Organic Reactions:
Introduction, electron displacement effects (resonance, inductive effects, hyperconjugation), organic reaction intermediates (carbanions, carbocations, carbenes, nitrenes), types of reactions (addition, substitution, elimination, free radical, rearrangement, oxidation and reduction).
(08 Hrs)</td></tr>
<tr><td>Unit-IV</td><td colspan="2">Stereochemistry :
Introduction, optical activity and chirality, optical isomerism, enantiomers, diastereomers, racemisation, resolution, optical purity.
Structural isomerism, conformational isomerism (including depiction of staggered and eclipsed conformations by Sawhorse projections, Newman projections, conformations of cyclohexane and cyclopentane structures), geometric isomerism.</td></tr>
</table>

	(05 Hrs)
Unit-V	Selective Organic Name Reactions and Rearrangements: Aldol Condensation, Knoevenagel condensation, Darzen Reaction, Beckmann Rearrangement, Diels Alder reaction, Suzuki-Miyaura reaction. (05 Hrs)
Unit-VI	Study of some Organic Compounds and their Functional Group Detections: Hydrocarbons : Ethylene, Propylene, Butadiene, Styrene, Vinyl chloride Carboxylic Acids : Adipic acid, Terepthalic acid Alcohols : Ethylene glycol Phenols : Phenol Amines : Melamine Amide : Urea, ε-caprolactum Nitrile : Acrylonitrile Aldehydes : Formaldehyde Carbohydrates : Glucose (07 Hrs)

References

Sr. No.	Title	Author	Publication	Edition
1.	Textbook of Organic Chemistry	Bahl and Bahl	S. Chand	18th
2.	Stereochemistry of Organic Compounds	P. S. Kalsi	New Age	5th
3.	Reactions, Reagents and Rearrangements	S.N. Sanyal	Bharti Bhavan	1st
4.	Organic Chemistry	F. A. Carry	Mc Graw Hill	3rd
5.	Practical Organic Chemistry	Frederick G. Mann and Bernard Charles Saunders	Longman Inc,New York	4th
6.	Organic Chemistry	T.W. Graham Solomons and Craig B.Fryle	John Wiley and Sons	7th
7.	Vogel's Textbook of Practical Organic Chemistry	Brian S. Furniss, Antony J. Hannaford, Peter W. G. Smith, Austin R. Tatchell	Longman Scientific & Technical	5th
8.	A Guidebook to Mechanism in Organic Chemistry	Peter Sykes	Longman Scientific & Technical	6th

<table>
<tr><td colspan="3">Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-III</td></tr>
<tr><td colspan="2">Course Code: PPE204
Course: Polymer Testing
Teaching Scheme:
Theory: 3 Hrs/week</td><td>Credits: 3-0-0
Mid Semester Examination-I: 15 Marks
Mid Semester Examination-II: 15 Marks
Teacher Assessment: 10 Marks
End Semester Examination: 60 Marks
End Semester Examination (Duration): 3 Hrs</td></tr>
<tr><td>Prerequisite</td><td colspan="2">• Basic knowledge of chemistry and physics.</td></tr>
<tr><td>Objectives</td><td colspan="2">• To impart understanding of the necessity and methodology of different polymer testing processes to evaluate polymer properties.</td></tr>
<tr><td>Unit-I</td><td colspan="2">a) Introduction:
Purpose of testing, destructive and non-destructive testing, specifications and standards, testing samples, sample conditioning.
b) Physicochemical properties:
Specific gravity, density (gradient method), water absorption.
(6 Hrs)</td></tr>
<tr><td>Unit-II</td><td colspan="2">Mechanical Properties:
Introduction, tensile strength, flexural strength, compressive strength, impact strength, abrasion, fatigue resistance, creep and stress relaxation, hardness, burst strength.
(6 Hrs)</td></tr>
<tr><td>Unit-III</td><td colspan="2">a) Optical Properties:
Introduction, refractive index, luminous transmittance, haze, colour evaluation.
b) Electrical Properties:
Introduction, dielectric strength, dielectric constant and dissipation factor, electrical resistance, electrical conductivity, arc resistance.
(6 Hrs)</td></tr>
<tr><td>Unit-IV</td><td colspan="2">a) Flammability:
Introduction, Ignition properties of plastics, Ignition temperature determination, oxygen index test, UL 94 flammability test.
b) Thermal Properties:
Introduction, heat distortion temperature, Vicat softening temperature, thermal conductivity, thermal expansion.
(6 Hrs)</td></tr>
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Unit-V	a) Chemical Properties: Introduction, immersion tests, stain resistance test, solvent stress cracking resistance, environmental stress cracking resistance. b) Weathering Properties: Accelerated weathering tests, outdoor weathering properties. (6 Hrs)
Unit-VI	Miscellaneous Test: Melt flow index, dilute solution viscosity test for thermoplastics, cup viscometer for thermosets, rheometer (rotational, capillary, torque). (6 Hrs)

References

Sr. No.	Title	Author	Publication	Edition
1.	Handbook of Plastics Testing Technology	Vishu Shah	A Wiley Interscience	2nd
2.	Handbook of Plastics Test Methods	R. P. Brown	Longman Scientific And Technical	3rd
3.	Testing & Evaluation of Plastics	Mathur and Bhardwaj	Allied publisher Pvt Ltd.	2003
4.	Identification and Testing of Plastics	A. S. Athalye	Multi-Tech Publishing,	1992

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Syllabus of Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-III</td></tr>
<tr><td colspan="2">Course Code: PPE205
Course: Physical Chemistry of Polymers
Teaching Scheme:
Theory: 3 Hrs/week</td><td>Credits: 3-0-0
Mid Semester Examination-I: 15 Marks
Mid Semester Examination-II: 15 Marks
Teacher Assessment: 10 Marks
End Semester Examination: 60 Marks
End Semester Examination (Duration): 3 Hrs</td></tr>
<tr><td>Prerequisite</td><td colspan="2">• Basic knowledge of physics and chemistry.</td></tr>
<tr><td>Objectives</td><td colspan="2">• This course is intended to introduce to the students the physicochemical concepts associated with the macromolecular chain nature of polymeric materials.
• The student will have a basic understanding of the physical and physicochemical principles which result from the chainlike structure of synthetic macromolecules.
• The student can predict major characteristics of a polymer from its chemical structure and molecular architecture.</td></tr>
<tr><td>Unit-I</td><td colspan="2">Structure of Polymer Chain:
Introduction to chain conformation, configurations, factors influencing stereoregularity, conformation of polymer chain.
(4 Hrs)</td></tr>
<tr><td>Unit-II</td><td colspan="2">Crystalline State of Polymers:
Degree of crystallinity, Crystallisability, T_c, Crystallization mechanisms (by stretching, from solution), Spherulite formation, nucleation, grain boundary, crystalline structures. Intermolecular orders: amorphous, crystalline and oriented forms of polymers, factors affecting crystallinity, properties affected by crystallinity of polymers.
(8 Hrs)</td></tr>
<tr><td>Unit-III</td><td colspan="2">Polymer Solutions:
Polymer Solutions: Dilute and Concentrate, phase separation; good, bad and theta solvents; Hilderbrand and Hansen solubility parameter.
(6 Hrs)</td></tr>
<tr><td>Unit-IV</td><td colspan="2">Thermodynamics of Polymer Solutions:
Laws of thermodynamics, enthalpy, entropy, Gibbs free energy, Helmholtz free energy, Clausius inequality, thermodynamic condition for solubility, Flory-Huggins theory, phase diagrams of binary solution; upper and lower critical solution</td></tr>
</table>

	temperature with examples of each kind. Thermodynamic and kinetic flexibility of polymer chains, practical importance of chain flexibility. (9 Hrs)
Unit-V	Osmosis: Osmotic pressure, vapour pressure osmometry, reverse osmosis (RO), ideal solution, Van't Hoff analysis, virial expansion, application in determining molecular weight of polymer. (5 Hrs)
Unit-VI	Polymer Surface Chemistry: Cohesive energy, surface tension and surface energy, contact angle (definition, theory and application), hydrophilic and hydrophobic polymer surfaces. (4 Hrs)

References

Sr. No.	Title	Author	Publication	Edition
1.	Polymer Science and Technology: Plastics, Rubber, Blends and Composites	Premamoy Ghosh	Tata McGraw Hill	2nd
2.	Polymer Science and Technology	Joel R. Fried	Prentice Hall of India Pvt. Ltd.	3rd
3.	Polymer Science	V. R. Gowarikar	New Age International Publishers	3rd 2005
4.	Introduction to Polymer Physics	M. Doi	Oxford Science	1995
5.	Principles of Polymer Chemistry	P.J. Flory	Cornell Univ. Press, New York	1955
6.	Introduction to Polymers.	Young, R. J., P. A. Lovell	Boca Raton, FL: CRC Press	2nd 2000
7.	Textbook of Polymer Science	Golding	Van Nostrand Reinhold Company	-
8.	Plastics Materials	J. A. Brydson	Elsevier	6th
9.	Textbook of Polymer Science	P. L. Nayak, S. Lenka	Kalyani	2nd

<table>
<tr><td colspan="3">Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-III</td></tr>
<tr><td colspan="2">Course Code: PPE221
Course: Laboratory of Introduction to Polymer Engineering
Teaching Scheme:
Practical: 2 Hrs/week</td><td>Credits: 0-0-1

Practical: 25 Marks</td></tr>
<tr><td>Objectives</td><td>:</td><td>• To identify and analyze the various properties of polymer materials.</td></tr>
<tr><td>List of Practical</td><td>:</td><td>Any 8 practical to be conducted

1. Identification of polymers by
a. Preliminary tests like cut test, drop test, float test.
b. Heating tests, solubility tests.
c. Confirmatory tests of specific polymers.
2. Determination of moisture and volatile content in plastics/rubbers.
3. Determination of bulk density of polymers.
4. Determination of water absorption in polymer sample.
5. Determination of molecular weight of polymer by viscometry.
6. Determination of the percentage purity of HMTA.
7. Determination of amine value.
8. Determination of acid value.
9. Determination of ash content.</td></tr>
</table>

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

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

<table>
<tr><td colspan="3">Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-III</td></tr>
<tr><td colspan="2">Course Code: PPE222
Course: Laboratory of Organic Chemistry of Polymers
Teaching Scheme:
Practical: 2 Hrs/week</td><td>Credits: 0-0-1

Practical: 25 Marks</td></tr>
<tr><td>Objectives</td><td>:</td><td>• To teach students the methods of finding purity, melting point as well as identifying various functional groups and elements in the organic compounds.</td></tr>
<tr><td>List of Practical</td><td>:</td><td>Any 8 practical to be conducted
1. Identification of functional groups: primary amine, carboxylic, phenolic, carbonyl, aromatic hydrocarbon etc.
2. Solubility test and classification of the compound.
3. Preparation of derivative, conclusion, naming of the compound / structure of compound.
4. Detection of N, S and halogens in organic compounds.
5. Estimation of Phenol from given solution.
6. Estimation of Formaldehyde from given solution
7. Determination of the percentage purity of Styrene.
8. Determination of Iodine value of given compound.
9. Molecular weight determination by acid base titration method.
10. Determination of melting point of solid and boiling point of liquid organic compounds.</td></tr>
</table>

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- Continuous assessment
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- Oral examination conducted on the syllabus and term work mentioned above.

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(Faculty of Science & Technology)
Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-III</td></tr>
<tr><td colspan="2">Course Code: PPE223
Course: Laboratory of Polymer Testing
Teaching Scheme:
Practical: 2 Hrs/week</td><td>Credits: 0-0-1

Practical: 25 Marks</td></tr>
<tr><td>Objectives</td><td>:</td><td>• To enable the students learn about various polymer testing procedures.
• To enable the students visualize the test method and machine operations for performing various testing on polymer materials/products.</td></tr>
<tr><td>List of Practical</td><td>:</td><td>Any 8 practical to be conducted

1. To determine the Tensile strength of given polymer sample.
2. To determine the Compression strength of given polymer sample.
3. To determine the Flexural strength of given polymer sample.
4. To determine the Impact strength of given polymer sample.
5. To determine the Hardness of given polymer sample.
6. To determine Melt Flow Index of given polymer sample.
7. To determine the surface resistance of given polymer product.
8. To determine specific gravity/density of given polymer sample.
9. To determine the Heat Deflection Temperature of given polymer sample.
10. To determine the Vicat Softening Temperature of given polymer sample.</td></tr>
</table>

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

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

<table>
<tr><td colspan="3">Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-III</td></tr>
<tr><td colspan="2">Course Code: PPE224
Course: Laboratory of Physical Chemistry of Polymers
Teaching Scheme:
Practical: 2 Hrs/week</td><td>Credits: 0-0-1
Term Work: 25 Marks</td></tr>
<tr><td>Objectives</td><td>:</td><td>• To teach students various techniques to determine physical properties of polymers such as solubility, refractive index, swelling parameter, surface energy.</td></tr>
<tr><td>List of Practical</td><td>:</td><td>Any 8 practical to be conducted

1. Determine of molecular weight by conductometric titration.
2. Determination of molecular weight by potentiometric titration.
3. Identification of good/ bad/ theta solvent of polymer.
4. Determination of solubility parameter.
5. Verify the applicability of a mixture of non-solvents as effective solvent of a polymer.
6. Determination of softening point of polymer.
7. Determination of swelling parameter.
8. Determination of UCST/ LCST of polymer.
9. Determination of surface energy of polymer.
10. Determination of refractive index of polymer solutions.</td></tr>
</table>

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

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

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science & Technology)

Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-III

Course Code: PPE225 Course: Development of Skills-III (Design Lab-I) **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 Practical: 25 Marks

Prerequisite	**:**	• Basic knowledge of engineering drawing.
Objectives	**:**	• To impart knowledge of handling CAD 2D software package in order to draft the engineering drawing.
List of Practical	**:**	**Any 8 practical to be conducted** 1. Introduction to CAD software along with the user interface. 2. To study and practice setting up limits, units, and other settings. 3. To study and practice basic draw tools including line, circle, rectangle, arc. 4. To study and practice modifying tools including copy, move, rotate, trim, mirror, scale, fillet, offset. 5. To study and practice use of drawing and construction aids including ORTHO, OSNAP, OTRACK, DYN, POLAR. 6. To study and practice line type, line weight, grouping, blocks, quick properties. 7. To study and practice use of dimensions, dimensioning style, editing dimensions, utilities applicable for 2D drawing. 8. To study and practice use of TEXT, TEXT styles etc. for 2D drawing. 9. To study and practice use of layers and colors. 10. To study and practice layout, printing and plotting.

		Sr. No.	**Title**	**Author**	**Publication**	**Edition**
References	**:**	1.	Up and Running with AutoCAD 2012	Elliot Gindis	Elsevier	-
		2.	Up and Running with	Elliot Gindis	Elsevier	-

			AutoCAD 2015			
		3.	Up and Running with AutoCAD 2017	Elliot Gindis	Elsevier	-
		4.	AutoCAD 2012 Essentials	Scott Onstott	John Wiley & Sons	-

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

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

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science & Technology)

Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-III

Course Code: PPE226 Course: Laboratory of Mechanical Operations **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 Term Work: 25 Marks

Prerequisite :

- Knowledge of physics, mathematics and fluid flow operations.

Objectives :

- To provide students with a thorough understanding and knowledge of the mechanical operating elements and adjustment.
- To make them aware of basics of different operations like Size Reduction, Filtration, Sedimentation, Grinding etc.
- To understand the working principles of various unit operations required in Plastic and Polymer Engineering.

List of Practical :

Any 8 practical to be conducted

1. To find particle size distribution by sieve analysis.
2. To determine the effectiveness of double deck vibrating screen.
3. To determine the crushing efficiency, reduction ratio in jaw crusher.
4. To determine the crushing efficiency of pulverizer.
5. To determine the effect of dry and wet grinding, critical speed of ball mill.
6. To determine the effect of number of balls on dry and wet grinding.
7. To determine the effect of diameter of the tank on batch settling.
8. To study constant pressure filtration characteristics and washing of cake in a plate and frame filter.
9. To study filter characteristics using vacuum filter.
10. To determine the efficiency of the grinder.

:

Sr. No.	Title	Author	Publication	Edition

References		1.	Principles of Unit Operation	A.S. Wenzel, L. A. Clump, C. W. Maus	Wiley India Pvt. Ltd.	2nd
		2.	Unit Operation in Chemical Engineering	G. C. Shekhar	Pearson Education	1st
		3.	Unit Operation in Chemical Engineering	McCabe and Smith	McGraw Hill	1st
		4.	Chemical Engineering Handbook	Perry and Chilton	McGraw Hill	1st

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

- Continuous assessment
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- Oral examination conducted on the syllabus and term work mentioned above.

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(Faculty of Science & Technology)
Syllabus of Syllabus of S. Y. B. Tech. Semester-IV
(All Branches)</td></tr>
<tr><td colspan="2">Course Code: BSH251
Course: Probability and Random Theory
Teaching Scheme:
Theory: 3 Hrs/week</td><td>Credits: 3-0-0
Mid Semester Examination-I: 15 Marks
Mid Semester Examination-II: 15 Marks
Teacher Assessment: 10 Marks
End Semester Examination: 60 Marks
End Semester Examination (Duration): 3 Hrs</td></tr>
<tr><td>Prerequisite</td><td colspan="2">• Students requires sufficient amount of knowledge of certain topics related to probability, random theory and statistics.</td></tr>
<tr><td>Objectives</td><td colspan="2">• To provide necessary basic concepts of probability, statistics, various discrete and continuous probability distributions and random theory.
• To provide basic ideas of probability, statistics including measures of central tendency, correlation and regression and random processes for applications engineering which can describe real life phenomenon.
• To help the students develop the ability to solve problems using probability and statistics.
• To connect probability and statistics to other fields both within and without mathematics.</td></tr>
<tr><td>Unit-I</td><td colspan="2">Basic Probability:
Introduction to probability, Sets, Fields, Events, Theorem of total probability, Conditional probability, independent events, Bayes’ theorem, Statistical independence and models of probability.
(7 Hrs)</td></tr>
<tr><td>Unit-II</td><td colspan="2">Probability Distribution:
Binomial distribution, Poisson distribution and Normal distribution, Evaluation of statistical parameters for these distributions.
(5 Hrs)</td></tr>
<tr><td>Unit-III</td><td colspan="2">Statistics-I:
Measures of central tendency: Mean Median, Quartiles and Mode. Measures of dispersion: Quartile deviation, Mean deviation, Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis.
(6 Hrs)</td></tr>
<tr><td>Unit-IV</td><td colspan="2">Statistics-II:
Curve fitting: Principle of least squares, Fitting of linear curve, Parabola, exponential curve, correlation and regression.</td></tr>
</table>

	(5 Hrs)
Unit-V	Random variables: Definition of random variables, discrete and continuous random variables, probability distribution function, density function and cumulative distribution function, Properties of probability and cumulative distribution function. (6 Hrs)
Unit-VI	Sampling Distributions: Definitions of population, sampling, parameters and statistics, Types of sampling, sampling distribution : Chi-square distribution, t distribution, F distribution, Standard error, sampling distribution of mean and sampling distribution of variance. (7 Hrs)

	Sr. No.	Title	Author	Publication	Edition
References	1.	Probability and Statistics for Engineers and Scientists	Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye	Pearson Publications	9th
	2.	Probability and Statistics for Engineers	Miller and Freund's	Pearson Educations	8th
	3.	A First Course in Probability	S. Ross	Pearson Education India	6th
	4.	Statistical Method	S. P. Gupta	S. Chand and Sons	37th
	5.	Higher Engineering Mathematics	Dr. B. S. Ramana	Khanna Publication	37th
	6.	A text book of Engineering Mathematics	N. P. Bali and Manish Goyal	Laxmi Publications	8th
	7.	Advanced Engineering Mathematics	Erwin Kreyszig	Wiley Eastern Ltd.	10th
	8.	Advanced Engineering Mathematics	C. R. Wylie	McGraw Hill Publications	6th
	9.	Advanced Engineering Mathematics	H. K. Dass	S. Chand and Co. Ltd	18th
	10.	Applied Mathematics	P. N. Wartikar, J. N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune	9th
Online course related video	11.	NPTEL, Swyam, edX, Coursera, Khan Academy etc.			

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<tr><td colspan="3">Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-IV</td></tr>
<tr><td colspan="2">Course Code: PPE252
Course: Heat Transfer
Teaching Scheme:
Theory: 3 Hrs/week</td><td>Credits: 3-0-0
Mid Semester Examination-I: 15 Marks
Mid Semester Examination-II: 15 Marks
Teacher Assessment: 10 Marks
End Semester Examination: 60 Marks
End Semester Examination (Duration): 3 Hrs</td></tr>
<tr><td>Prerequisite</td><td colspan="2">• Stoichiometry.</td></tr>
<tr><td>Objectives</td><td colspan="2">• To understand the fundamental concepts, modes of heat transfer.
• To understand various heat exchangers used in industries.
• To understand applications of heat transfer in polymer industry.</td></tr>
<tr><td>Unit-I</td><td colspan="2">a) Introduction
Modes of heat transfer, fundamental laws used in heat transfer (law of conservation of mass, Newton’s laws of motion, laws of thermodynamics).

b) Heat transfer by conduction
Fourier’s law, Steady state heat conduction; one plane wall of uniform thickness, compound resistances in series, heat flow through cylinder and sphere, thermal insulation, critical and economic thickness, heat transfer through extended surfaces of uniform cross section.
(6 Hrs)</td></tr>
<tr><td>Unit-II</td><td colspan="2">Heat transfer by convection:
Free and forced convection, Individual and overall heat transfer coefficient, fouling factor, dimensional analysis, dimensional groups used in heat transfer, film coefficients in pipes for laminar, turbulent and transitional flow, Wilson plot, empirical correlations for natural convection.
(6 Hrs)</td></tr>
<tr><td>Unit-III</td><td colspan="2">Heat transfer by Radiation:
Concept of black body and grey body, laws of black body radiation, radiative heat transfer coefficient, concept of radiation shield and radiation shape factor.
(6 Hrs)</td></tr>
<tr><td>Unit-IV</td><td colspan="2">Heat transfer of fluid with phase change:</td></tr>
</table>

	Theory of boiling, pool boiling of saturated liquid, correlations in pool boiling heat transfer, drop-wise and film-wise condensation, application of boiling and condensation. (6 Hrs)
Unit-V	Heat exchangers: Classification of heat exchangers, Flow arrangements in heat exchanger, log mean temperature difference, energy balance in heat exchangers, dirt factor, selection criteria for various heat exchangers in industry, design of double pipe heat exchanger, and shell and tube heat exchanger. (6 Hrs)
Unit-VI	Applications of Heat Transfer in Polymer Engineering: Thermal conductivity standards of plastic, heat transfer coefficient for different polymer processing equipments, molding defects due to heat transfer rate and remedies, application of heat transfer in polymer processing plants. (6 Hrs)

References

Sr. No.	Title	Author	Publication	Edition
1.	Heat Transfer	D. Q. Kern	McGraw Hill Co.	1st 2000
2.	Heat Transfer	J. P. Holman	Mcgraw Hill Company	8th 2006
3.	Heat Transfer: A Practical Approach	Yunus A. Cengel	Mcgraw Hill Company	3rd 2007
4.	Polymer Processing: Principles and Modeling	Jean-Francois Agassant, Pierre Avenas, Pierre J. Carreau	Hanser Publications	2nd 2017
5.	Unit Operations of Chemical Engineering	McCabe and Smith	McGraw Hill Co.	6th 2007
6.	Chemical Engineering (Vol I & II)	Richardson and Coulson	McGraw Hill Co.	5th 2002
7.	Heat Transfer	S. P. Sukhatme	Universities Press	4th 2006
8.	Heat & Mass Transfer	R. K. Rajput	S. Chand	4th 2001

<table>
<tr><td colspan="3">Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-IV</td></tr>
<tr><td colspan="2">Course Code: PPE253
Course: Polymer Synthesis and Manufacturing
Teaching Scheme:
Theory: 3 Hrs/week</td><td>Credits: 3-0-0
Mid Semester Examination-I: 15 Marks
Mid Semester Examination-II: 15 Marks
Teacher Assessment: 10 Marks
End Semester Examination: 60 Marks
End Semester Examination (Duration): 3 Hrs</td></tr>
<tr><td>Prerequisite</td><td colspan="2">• Introduction to Polymer Engineering.
• Organic Chemistry of Polymers.</td></tr>
<tr><td>Objectives</td><td colspan="2">To provide a
• General overview of synthesis of Polymers.
• General overview of kinetics and different techniques of polymerization.
• A thorough understanding and knowledge of manufacturing processes of various thermoplastics and thermosets.</td></tr>
<tr><td>Unit-I</td><td colspan="2">Introduction:
Definition and characteristics of monomers, initiators, catalysts, chain transfer agents, inhibitors, retarders, polymers, homo- and co-polymerization.
Brief idea about different polymerization techniques: bulk, solution, suspension, emulsion and interfacial polymerization (sample recipes, examples of polymers prepared by these techniques).
(4 Hrs)</td></tr>
<tr><td>Unit-II</td><td colspan="2">Addition Polymerization:
Free radical polymerization, ionic polymerization, free radical copolymerization: theory, techniques, mechanism, kinetics (assumptions and derivations of rate of polymerization), advantages and disadvantages, examples of polymers prepared by these methods.
Chain transfer, inhibition and retardation, autoacceleration, number average degree of polymerization, numericals.
(7 Hrs)</td></tr>
<tr><td>Unit-III</td><td colspan="2">Condensation Polymerization:
Kinetics of condensation polymerization, copolymerization, examples of polymers prepared by these methods. Carother’s equation. Reactivity of functional groups, rate of polymerization, catalyzed and self-catalyzed polyesterification reaction, stoichiometric control of molecular weight, effect of temperature on rate of polymerization, number average degree of polymerization, numericals.
(7 Hrs)</td></tr>
</table>

Unit-IV	Manufacturing of Thermoplastic Materials: Ziegler-Natta polymerization and metallocene polymerization with emphasis on manufacturing of PE and PP, Raw materials and manufacturing processes of PS, HIPS, ABS, PET, PC and PTFE. Ring-opening polymerization of Nylon 6, manufacturing processes of Nylon 66 and Aramid with emphasis on commercial production processes of each. (7 Hrs)
Unit-V	Manufacturing of Thermosetting Materials: Raw materials, commercial production process, resinification and crosslinking of phenol formaldehyde resins, amino resins (UF and MF), epoxies and alkyds. (7 Hrs)
Unit-VI	Miscellaneous Materials: Raw materials and manufacturing of silicones (rubber and plastics) and polyurethanes (foam, adhesive, plastic and rubber). (4 Hrs)

References

Sr. No.	Title	Author	Publication	Edition
1.	Polymer Science and Technology: Plastics, Rubber, Blends and Composites	Premamoy Ghosh	Tata McGraw Hill	2nd
2.	Plastics Materials	J. Brydson	Butterworth Hienemann	7th
3.	Introduction to Polymer Science and Chemistry: A Problem-Solving Approach	Manas Chanda	CRC Press	2nd
4.	Principles of Polymerization	George Odian	Wiley Interscience	4th
5.	Handbook of Industrial Polyethylene and Technology Definitive Guide to Manufacturing, Properties, Processing, Applications and Markets	Mark A. Spalding and Ananda M. Chatterjee	Scrivener Publishing	2nd
6.	Practical Guide to Polypropylene	Devesh Tripathi	RAPRA Technology Ltd.	1st
7.	Polyurethane and Related Foams	Kaneyoshi Ashida	Taylor and Francis	1st

<table>
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Syllabus of Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-IV</td></tr>
<tr><td colspan="2">Course Code: PPE254
Course: Polymer Additives and Compounding
Teaching Scheme:
Theory: 3 Hrs/week</td><td>Credits: 3-0-0
Mid Semester Examination-I: 15 Marks
Mid Semester Examination-II: 15 Marks
Teacher Assessment: 10 Marks
End Semester Examination: 60 Marks
End Semester Examination (Duration): 3 Hrs</td></tr>
<tr><td>Prerequisite</td><td colspan="2">• Introduction to Polymer Engineering.
• Organic Chemistry of Polymers.</td></tr>
<tr><td>Objectives</td><td colspan="2">• To understand about different additives and its applications.
• To understand the process of incorporation of additives in polymers for achieving desired properties in the final material/compound.
• To be able to formulate a recipe for product development.
• To understand the commercial process for manufacturing of polymer compounds.</td></tr>
<tr><td>Unit-I</td><td colspan="2">Introduction:
Introduction, classification of additives, technical requirements of use of additives in polymer compounding, types of additives used in polymers.
(4 Hrs)</td></tr>
<tr><td>Unit-II</td><td colspan="2">Fillers and reinforcements :
a) Fibrous fillers: Properties and applications of jute, coir, hemp, aramid, polypropylene, carbon and glass fibers.
b) Other fillers: properties and applications of wood, calcium carbonate, talc, wollastonite, clay and silicates.
(5 Hrs)</td></tr>
<tr><td>Unit-III</td><td colspan="2">Stabilizers, Colorants and Processing Aids:
a) Stabilizers: Photodegradation of polymers, antioxidants, antiozonants, heat stabilizers.
b) Colorants: Pigments and dyes, types of pigments and their role in coloration, masterbatches, color matching.
c) Plasticizers: Plasticizers and anti-plasticizers, properties, characteristics and applications.
d) Lubricants: Types and effect of lubricants, zinc stearate, waxes.
(9 Hrs)</td></tr>
<tr><td>Unit-IV</td><td colspan="2">Miscellaneous Additives:
Impact modifiers, peptizers, blowing agents, flame retardants, nucleating agents,</td></tr>
</table>

	coupling agents, anti-microbial agents, anti-fogging agents, anti-static agents, metal deactivators, crosslinking agents, biodegradable additives. (6 Hrs)
Unit-V	Polymer compounding: process, machinery and devices: Mixing mechanisms, internal batch mixers, continuous mixers, two roll mill, single screw extruder, modular twin screw extruder, rotation mechanisms, screw elements, kneaders, vent and vacuum ports, conveying systems: feeding types, feeders and screws, feed enhancement technology (FET). (8 Hrs)
Unit-VI	Formulations, Manufacturing and Quality Control: Formulating compounding recipe, Material movement in manufacturing, formulations based on PC/ABS blend and Polyamide 6 for engineering product compound manufacture, Manufacturing and in-line quality control, safety and health hazards. (4 Hrs)

References

Sr. No.	Title	Author	Publication	Edition
1.	The Additives for Plastics Hand Book	John Murphy	Elsevier Advanced Technology	2nd 2001
2.	Plastics Additives	R. Gachter and H. Muller	Hanser Publishers	3rd 1993
3.	Plastics Additives and Modifiers Handbook	Jesse Edenbaum	Springer	1st 1992
4.	Mixing and Compounding of Polymers: Theory and Practice	Ica Manas – Zloczower and Zehev Tadmor	Hanser Publications	2nd 2009
5.	Polymer Mixing and Extrusion Technology	Nicholas P. Cheremisionoff	Marcel Decker Inc.	1st 1987
6.	Plastics Materials	J. A. Brydson	Butterworth Heinemann	7th 1999
7.	Polymer Mixing Technology and Engineering	J. L. White, A. L. Coran and A. Moet	Hanser Gardner Publications Ltd.	1st 2001
8.	Understanding Compounding	R. H. Wildi and C. Maier	Hanser Gardner Publications	1st 1998
9.	A concise introduction to additives for thermoplastic polymers	Johannes Karl Fink	Scrivener Publishing	1st 2010

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Syllabus of Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-IV</td></tr>
<tr><td colspan="2">Course Code: PPE255
Course: Professional Elective Courses-I:
Process Calculations
Teaching Scheme:
Theory: 3 Hrs/week</td><td>Credits: 3-0-0
Mid Semester Examination-I: 15 Marks
Mid Semester Examination-II: 15 Marks
Teacher Assessment: 10 Marks
End Semester Examination: 60 Marks
End Semester Examination (Duration): 3 Hrs</td></tr>
<tr><td>Prerequisite</td><td colspan="2">• Basic Engineering Mathematics and Organic Chemistry of Polymers.</td></tr>
<tr><td>Objectives</td><td colspan="2">• To understand the basic calculation of various processes in Polymer Engineering.
• To study the calculations of energy requirements of processes.
• To understand the implications of steady state processes of various unit operations through material balances with and without chemical reactions.</td></tr>
<tr><td>Unit-I</td><td colspan="2">Basic Units and Conversion:
Vapor pressure, partial pressure, ideal gas law, Dalton’s law, Raoult’s law, Amagat’s law, weight percent, volume percent, mole percent, normality, molarity, molality, density of gas mixture, average molecular weight of mixture.
(8 Hrs)</td></tr>
<tr><td>Unit-II</td><td colspan="2">Material Balance without Chemical Reaction:
Material balance for distillation, drying, extraction, absorption, evaporation.
(6 Hrs)</td></tr>
<tr><td>Unit-III</td><td colspan="2">Material Balance with Chemical Reaction:
Material balance with different types of chemical reactions. Limiting and excess reactants.
(4 Hrs)</td></tr>
<tr><td>Unit-IV</td><td colspan="2">Energy Balance:
Energy balance with chemical reactions, heat capacity of pure substances and mixtures, standard heat of reaction, standard heat of formation, standard heat of combustion.
(6 Hrs)</td></tr>
<tr><td>Unit-V</td><td colspan="2">Humidification:
Relative humidity, percent saturation, dew point, dry and wet bulb temperature, psychometric chart.
(6 Hrs)</td></tr>
</table>

<table>
<tr><td>Unit-VI</td><td colspan="5">Fuels and Combustion:
Types of fuels and combustion, calorific value, air requirement, theoretical and excess calculations.
(6 Hrs)</td></tr>
<tr><td rowspan="5">References</td><td>Sr. No.</td><td>Title</td><td>Author</td><td>Publication</td><td>Edition</td></tr>
<tr><td>1.</td><td>Stoichiometry</td><td>Bhatt and Vora</td><td>Tata McGraw Hill</td><td>4th</td></tr>
<tr><td>2.</td><td>Chemical Process Principles (Part-I)</td><td>Hougen & Watson</td><td>Asia Publishing House</td><td>2nd</td></tr>
<tr><td>3.</td><td>Basic Principles and Calculation</td><td>D. M. Himmelblau</td><td>Prentice-Hall India</td><td>6th</td></tr>
<tr><td>4.</td><td>Stoichiometry and Process Calculations</td><td>K. V. Narayanan, B. Lakshmikutty</td><td>PHI Learning Pvt. Ltd</td><td>2nd</td></tr>
</table>

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<tr><td colspan="3">Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-IV</td></tr>
<tr><td colspan="2">Course Code: PPE256
Course: Professional Elective Courses-I: Materials Engineering
Teaching Scheme:
Theory: 3 Hrs/week</td><td>Credits: 3-0-0
Mid Semester Examination-I: 15 Marks
Mid Semester Examination-II: 15 Marks
Teacher Assessment: 10 Marks
End Semester Examination: 60 Marks
End Semester Examination (Duration): 3 Hrs</td></tr>
<tr><td>Prerequisite</td><td colspan="2">• Nil</td></tr>
<tr><td>Objectives</td><td colspan="2">Students will be able to :
• Understand the basic concepts and properties of materials.
• Convey the significance of material selection in process designing.
• Understand structure property relationship and selection of appropriate material for specific applications.
• Explain the latest developments in material science and technology.</td></tr>
<tr><td>Unit-I</td><td colspan="2">Introduction: Materials, Atomic Bonding and Crystal Structure Role:
Introduction, history and evolution of materials, classification of materials, need to study of materials, bonding in atoms, concepts of unit cell and Bravais lattice, crystallographic directions and planes, Miller indices, linear and planar density, crystal defects.
(6 Hrs)</td></tr>
<tr><td>Unit-II</td><td colspan="2">Materials: Mechanical Properties:
Concept of stress-strain, shear stress, torsion, mechanical properties: tensile strength, ductility, brittleness, resilience, toughness, impact strength, hardness, creep, damping.
(6 Hrs)</td></tr>
<tr><td>Unit-III</td><td colspan="2">Metals and Ceramics:
a) Metals: Ferrous alloys: classification, types of steels, effect of impurities, cast iron, non-ferrous alloys: aluminium and its alloys, copper and its alloys, nickel and its alloys, zinc and its alloys, titanium and its alloys, cobalt and its alloys, bulk metallic glass, strengthening and corrosion in metals.
b) Ceramics: Introduction, classification, ceramic crystal structure, processing of</td></tr>
</table>

<table>
<tr><td></td><td colspan="5">ceramics, ceramic elastic modulus, Weibull modulus, hardness, fracture toughness, failure in ceramics.
(6 Hrs)</td></tr>
<tr><td>Unit-IV</td><td colspan="5">Polymers:
Basics of polymers, classification criteria, applications, concept of molecular weight, crystallinity, tacticity, glass transition temperature, experimental methods to determine glass transition temperature, factors affecting glass transition temperature, stress-strain relationships in polymers, stress-strain behaviour, fracture and fatigue, factors affecting mechanical behaviour.
(6 Hrs)</td></tr>
<tr><td>Unit-V</td><td colspan="5">Composites:
Introduction, definition, composite classification, fiber reinforced composites (polymer matrix, metal matrix, ceramic matrix, carbon-carbon composites), structural composites, manufacturing and processing of composites (hand lay-up, spray lay-up, pultrusion, prepreg, resin-transfer moulding, pressure bag and vacuum bag techniques).
(6 Hrs)</td></tr>
<tr><td>Unit-VI</td><td colspan="5">Material Selection in Engineering Design:
Introduction to material selection: mechanical design, design flow chart, doubling time, resource availability, eco efficiency, Ashby chart.
Material selections for 1) cantilever beam (a) high stiffness and light weight, (b) high strength and light weight), and 2) connecting rods for high performance engines.
(6 Hrs)</td></tr>
<tr><td>References</td><td>Sr. No.</td><td>Title</td><td>Author</td><td>Publication</td><td>Edition</td></tr>
<tr><td></td><td>1.</td><td>Fundamentals of Material Science and Engineering</td><td>William D. Callister</td><td>John Wiley & Sons. Inc.</td><td>6th</td></tr>
<tr><td></td><td>2.</td><td>Material Science and Engineering</td><td>V. Raghavan</td><td>Prentice Hall of India</td><td>5th</td></tr>
<tr><td></td><td>3.</td><td>Foundation of Material Science & Engineering</td><td>William Smith, Javad Hashemi</td><td>McGraw Hill</td><td>5th</td></tr>
<tr><td></td><td>4.</td><td>Polymer Science and Technology</td><td>Joel R. Ried</td><td>Prentice Hall</td><td>3rd</td></tr>
<tr><td></td><td>5.</td><td>Introduction to Material science for Engineers</td><td>James F. Shackleford</td><td>Pearson</td><td>8th</td></tr>
</table>

<table>
<tr><td colspan="3">Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-IV</td></tr>
<tr><td colspan="2">Course Code: PPE257
Course: Professional Elective Courses-I:
Fiber Technology
Teaching Scheme:
Theory: 3 Hrs/week</td><td>Credits: 3-0-0
Mid Semester Examination-I: 15 Marks
Mid Semester Examination-II: 15 Marks
Teacher Assessment: 10 Marks
End Semester Examination: 60 Marks
End Semester Examination (Duration): 3 Hrs</td></tr>
<tr><td>Prerequisite</td><td colspan="2">• Introduction to Polymer Engineering.
• Polymer Testing.</td></tr>
<tr><td>Objectives</td><td colspan="2">• To understand different terminologies associated with fiber technology.
• To acquire fundamental knowledge about natural and man-made fibers, their structures and the basic characteristics.
• To gain knowledge about preparation of man-made fibers.
• To acquire knowledge about processing and applications of fibers.</td></tr>
<tr><td>Unit-I</td><td colspan="2">Introduction to Fiber Technology:
Definitions and terminologies, classification (natural, synthetic, regenerated fibers), staple and filament fibers, orientation in fiber structure, general idea about the physical properties of fibers (fiber length, fineness, tenacity, initial modulus, work of rupture, work factor, moisture content and regain with examples), numerical problems on conversion, comparative mechanical properties of fibers, physical and chemical identification of fibers, types of yarns and fabrics, brief idea about testing methods, applications of fiber, yarn and fabric.
(7 Hrs)</td></tr>
<tr><td>Unit-II</td><td colspan="2">Natural Fibers:
Structure, properties and applications of the following fibers: cotton, flax, wool, silk.
(4 Hrs)</td></tr>
<tr><td>Unit-III</td><td colspan="2">Man-made Fiber Production Methods:
Melt spinning, dry spinning, wet spinning, dry-jet wet spinning, electrospinning. Production of polyester, Nylon 6, acrylic, viscose rayon.
(7 Hrs)</td></tr>
<tr><td>Unit-IV</td><td colspan="2">Structures of Yarn and Fabric:
Types of twist, twist multiplier, contraction and retraction factor, relation between mechanical properties of fiber and yarn, fabric nomenclature, basic weave structures (plain, twill, matt), packing fraction, brief idea about knitted and non-woven fabric design.</td></tr>
</table>

	(5 Hrs)
Unit-V	Chemical Processing: General idea about post-synthesis chemical processing of textile fiber, yarn and fabric: desizing, scouring, bleaching (bleaching powder, sodium hypochlorite and hydrogen peroxide), dyeing (types of dyes and their applicability on fibers, dye cycle, Munshell color wheel), mercerization, outline of the types of chemical finishing. (6 Hrs)
Unit-VI	Mechanical Processing: General idea about post-synthesis mechanical processing of textile fiber, yarn and fabric: blowroom, carding, combing, roving, spinning, warping, beaming, weaving, knitting and nonwoven production, singeing; outline of the types of mechanical finishing. (7 Hrs)

References

Sr. No.	Title	Author	Publication	Edition
1.	Manufactured Fiber Technology	V. B. Gupta, V. B. Kothari	Springer	1st
2.	Man-made Fibers	R. W. Moncrieff	Wiley	1st
3.	Textile Science: An Explanation of Fiber Properties	E. P. G. Gohl, L. D. Vilensky	Guilford Publications	1st
4.	Dyeing and Chemical Technology of Textile Fibers	E. R. Trotman	John Wiley & Sons Inc.	4th
5.	Man-made Fibers (Vol. I & II)	Gordon J. Cook	Woodhead Publishing	1st
6.	Textile Yarns: Technology, Structure, and Applications	B. C. Goswami, J. G. Martindale, F. L. Scardino	John Wiley & Sons Inc.	1st
7.	Principles of Weaving	R. Marks, A. T. C. Robinson	The Textile Institute	1st
8.	Fundamentals and Advances in Knitting Technology	Sadhan C. Ray	WPI Publishing	1st
9.	Handbook of Nonwovens	S. Russell	Elsevier	2nd

Website	1.	https://nptel.ac.in/courses/116/102/116102026/
	2.	https://nptel.ac.in/courses/116/102/116102010/
	3.	https://nptel.ac.in/courses/116/102/116102016/

<table>
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<tr><td colspan="2">Course Code: PPE271
Course: Laboratory of Heat Transfer
Teaching Scheme:
Practical: 2 Hrs/week</td><td>Credits: 0-0-1

Practical: 25 Marks</td></tr>
<tr><td>Objectives</td><td>:</td><td>• A practical exposure to the students with relevance to different modes of heat transfer and heat transfer equipments.</td></tr>
<tr><td>List of Practical</td><td>:</td><td>Any 8 practical to be conducted

1. Determination of thermal conductivity of insulating powder.
2. Determination of thermal resistances of a composite wall.
3. Determination of thermal conductivity of metal rod.
4. Determination of heat transfer coefficient by natural convection.
5. Determination of heat transfer coefficient by forced convection.
6. To determine heat transfer, fin efficiency and temperature distribution along the length of pin-fin in natural convection.
7. Determination of heat transfer coefficient in double pipe heat exchanger.
8. Determination of Stefan Boltzmann constant in Radiation.
9. Determination of emissivity of the test plate surface at various temperatures.</td></tr>
</table>

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

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

<table>
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<tr><td colspan="2">Course Code: PPE272
Course: Laboratory of Polymer Synthesis and Manufacturing
Teaching Scheme:
Practical: 4 Hrs/week</td><td>Credits: 0-0-2

Practical: 50 Marks</td></tr>
<tr><td>Objectives</td><td>:</td><td>• To prepare thermoplastics and thermosetting polymer through different polymerization techniques.
• To provide the practical exposure of polymer synthesis in the laboratory.</td></tr>
<tr><td>List of Practical</td><td>:</td><td>Any 8 practical to be conducted

1. Synthesis of Resol.
2. Synthesis of Novolac.
3. Synthesis of urea formaldehyde.
4. Synthesis of melamine formaldehyde.
5. Synthesis of polyacrylamide by free radical polymerization.
6. Synthesis of acrylamide-acrylic acid copolymer by solution polymerization.
7. Synthesis of PMMA by emulsion polymerization technique.
8. Synthesis of alkyd resin.
9. Synthesis of epoxy resin.
10. Synthesis of unsaturated polyester.</td></tr>
</table>

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<tr><td colspan="2">Course Code: PPE274
Course: Laboratory of Process Calculations
Teaching Scheme:
Practical: 2 Hrs/week</td><td>Credits: 0-0-1
Term Work: 25 Marks</td></tr>
<tr><td>Objectives</td><td>:</td><td>• To understand basic calculations and work practically.
• Solving a case study in relevance to the terms studied in theory.</td></tr>
<tr><td>List of Practical</td><td>:</td><td>Any 8 practical to be conducted

1. To study calculations and prepare a solution of given normality.
2. To study calculations and prepare a solution of given molarity and molality.
3. To study calculations and prepare solution of given weight % and volume %.
4. To determine the normality, molarity and molality of an unknown solution.
5. To study calculations and solve material balance in distillation.
6. To study calculations and solve material balance in drying.
7. To study and calculate limiting and excess reactant of a given system.
8. To calculate the terms involved in humidification using psychrometric chart.
9. To study and calculate calorific value of fuel.
10. Case study.</td></tr>
</table>

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<tr><td colspan="2">Course Code: PPE275
Course: Laboratory of Materials Engineering
Teaching Scheme:
Practical: 2 Hrs/week</td><td>Credits: 0-0-1
Term Work: 25 Marks</td></tr>
<tr><td>Objectives</td><td>:</td><td>Students will be able to:
Gain basic knowledge of science behind materials.
Understand the concept of structure property relations in materials.
Understand and carry out the demonstrations to find out the different properties of materials.</td></tr>
<tr><td>List of Practical</td><td>:</td><td>Any 8 practical to be conducted

1. Preparation of models of various Bravais space lattice
2. Determination of tensile strength of given material.
3. Determination of hardness of given material.
4. Determination of impact strength of given material.
5. Comparison of stress-strain behaviour of metals, ceramics and polymers.
6. Determination of glass transition temperature of given polymeric material.
7. Preparation of polymer matrix composite by hand lay up technique.
8. Study of different selection parameters of best material for given component.
9. Selection of cost-effective material for a circular cross-section cantilever beam loaded at its end having high stiffness and light weight.
10. Selection of material for a circular cross-section cantilever beam loaded at its end having high strength and light weight.</td></tr>
</table>

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- Continuous assessment
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Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-IV</td></tr>
<tr><td colspan="2">Course Code: PPE276
Course: Laboratory of Fiber Technology
Teaching Scheme:
Practical: 2 Hrs/week</td><td>Credits: 0-0-1
Term Work: 25 Marks</td></tr>
<tr><td>Objectives</td><td>:</td><td>• To identify fibers and determination of different physical characteristics of fiber, yarn and fabric.</td></tr>
<tr><td>List of Practical</td><td>:</td><td>Any 8 practical to be conducted

1. Identification of fiber through burning test.
2. Identification of fiber through solubility test.
3. Identification of fibers through microscopy.
4. Determination of moisture regain and moisture content of fiber.
5. Determination of mean fiber length, effective fiber length and short fiber percentage for cotton fiber.
6. Comparison of mechanical properties of fibers from comparative stress-strain graphs.
7. Determination of type of twist, t.p.i. and t.p.c. of a spun yarn.
8. Determination of twist multiplier of a yarn in direct and indirect system.
9. Determination of linear density of yarn.
10. Determination of contraction factor, retraction factor and surface helix angle of a spun yarn.
11. Determination of thread density in woven fabric.
12. Identification of weaving design of a fabric.
13. Determination of packing fraction of a fabric.</td></tr>
</table>

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

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

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science & Technology)

Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-IV

Course Code: BSH277 Course: Development of Skills-IV (Basic Science) **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 Practical: 25 Marks (Online Examination)

Objectives :

- Students will be able to communicate in English accurately and effectively.
- Students will be able to enhance employability skills.
- Students will be able to participate in debate and group discussion in English effectively.
- Students will be able to enhance verbal ability.
- Students will be able to face interview effectively.

List of Practical :

Sr. No.	Contents	Duration (Hrs)
Unit-I	Common Errors in English Communication • Grammatical • Spelling • Pronunciation	2
Unit-II	Enhancing Employability skills • Job application • Resume / CV • Essay • Reading Comprehension	6
Unit-III	Debate and Group Discussion • Communication • Body language • Appearance • Knowledge of the topic • Preparation	4

		Unit-IV	Verbal Ability • Synonyms • Antonyms • Idioms and Phrases • One word substitution • Word analogy • Verbal reasoning			4
		Unit-V	Presentation Skills • Body language • Grooming • Group dynamics • Preparation: power point, Prezi, vizme, etc.			2
		Unit-VI	Interview Skills • Body language • Grooming • Preparation			2
		Sr. No.	**Title**	**Author**	**Publication**	**Edition**
		1	Verbal and Non-Verbal Reasoning	R.S. Agrawal	S. Chand Publication	-
		2	Effective Technical Communication	Anne Eisenberge	Mc Graw Hill International Editors	-
		3	Professional Communication Skills	A. K. Jain, Pravin, S. R. Bhatia, A. M. Sheikh	S. Chand & Company Ltd.	-
		4	Business Communication	Urmila Rai, S. M. Rai	Himalaya Publishing House	-
		5	Better English Pronunciation	J.D.O'Connor.	Cambridge University Press	-
		6	Grammar of Spoken and Written English	Dauglas Biber, Geoffrey Leech	Longman	-
		7	Technical Communication-Principles and	Meenakshi Raman & Sangeeta Sharma	Oxford University Press	-

			Practice			
		8	A course in Phonetics & Spoken English	J. .Sethi, P. V. Dhamija	PHI publication	-
		9	Communication Skills for Engineers	Sunita Mishra, C. Murli Krishna	Pearson Education	-
		10	Soft Skills: Enhancing Employability: Connecting Campus with Corporate	M. S. Rao	I.K. International	-
		11	Technical Communication A Reader Centred Approach	Paul V. Anderson	Thomson Publication	-
		12	Grammar of Spoken and Written English	Dauglas Biber, Geoffrey Leech	Longman	-
		13	Oxford English Grammar	Sydney Greenbaum	Oxford University Press	-

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science & Technology)

Syllabus of S. Y. B. Tech. (Plastic and Polymer Engineering) Semester-IV

Course Code: PPE278	Credits: 0-0-0
Course: Laboratory of Computer Fundamentals	Term Work: 25 Marks
Teaching Scheme:	
Practical: 2 Hrs/week	

Objectives	**:**	• To impart knowledge of the foundational concepts of computer hardware, software, operating systems, peripherals and its effective use.
List of Practical	**:**	**Any 8 practical to be conducted** 1. To study fundamentals of computer hardware components. 2. To study fundamentals of Windows and Linux operating systems. 3. To study and practice basics of Word: Introduction, Word document interface, customizing the Word application, document views, basic editing and formatting in Word, keyboard shortcuts, Export options. 4. To study and practice advanced Word: Advanced editing and formatting of Word document, navigating through a Word document, mail merge, and printing setup. 5. To study and practice basics of Excel worksheet: Introduction, workbook, worksheet, basic editing and formatting in Excel worksheet, keyboard shortcuts, export options. 6. To study and practice advanced Excel worksheet: Advanced formatting in Excel worksheet, filters, working with formulas, navigating through Excel files, printing Setup. 7. To study and practice basics of PowerPoint: Introduction, creating presentation, basic editing and formatting in PowerPoint, keyboard shortcuts, export options. 8. To study and practice advanced PowerPoint: Advanced formatting, using templates, charts, animation, inserting tables, and printing setup. 9. To study data extraction and drawing of different types of graphs (2D and

		3D). 10. Drawing molecular structures using softwares. 11. To study and practice computer security settings, networking, and computer application: Introduction, file sharing, remote access, internet services, security and various computer applications.

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

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