



Plastindia International University, Vapi, Gujarat



PLASTINDIA INTERNATIONAL UNIVERSITY

(Sponsored by Plastindia Foundation)

Dungra, GIDC, Vapi, Dist. Valsad - 396193, Gujarat, India

(Established under Gujarat Government Private Universities Act, 2016)



School of Engineering

B. Tech (Plastics and Polymer Engineering)

P-2025



Rupam



FY B. Tech. (Plastics and Polymer Engineering)

Course Category	Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks							Credits			
			Theory	Practical	Contact Hr/Week	ISE- I	ISE - II	TA	ESE	TW	PR/OR	TOTAL	TH	TW/PR	TOTAL	In Line With UMI
Semester - I																
BSC	BSC101	Calculus - I	3	-	3	15	15	20	50	-	-	100	3	-	3	√
BSC	BSC102	Engineering Physics	3	-	3	15	15	20	50	-	-	100	3	-	3	√
ESC	ESC121	Materials Science and Engineering	3	-	3	15	15	20	50	-	-	100	3	-	3	
ESC	ESC122	Integrated Electrical and Electronics Engineering	3	-	3	15	15	20	50	-	-	100	3	-	3	
ESC	ESC123	Engineering Graphics and Design	3	-	3	15	15	20	50	-	-	100	3	-	3	
HSSM	HSSM131	Universal Human Values	2	-	2	-	-	-	50	-	-	50	2	-	2	
BSC	BSC141	Lab: Engineering Physics	-	2	2	-	-	-	-	-	25	25	-	1	1	
ESC	ESC142	Lab: Engineering Graphics and Design	-	2	2	-	-	-	-	25	-	25	-	1	1	
ESC	ESC143	Lab: Integrated Electrical and Electronics Engineering Laboratory	-	2	2	-	-	-	-	-	25	25	-	1	1	
VSEC	VSEC132	Lab: Design Thinking and Innovation	-	2	2	-	-	-	-	25	-	25	-	1	1	
HSSM	HSSM133	Yoga and Meditation	-	2	2	Non- Credit Mandatory Course										
Total			17	10	27	75	75	100	300	50	50	650	17	4	21	





**FY B. Tech (Plastics and Polymer Engineering),
Semester-I**





Year, Program, Semester	F.Y. B. Tech in Plastics and Polymer Engineering, Semester-I						
Course Code	BSC101						
Course Category	BSC (Basic Sciences and Humanities Courses)						
Course title	Calculus – I						
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits		
	03	-	-	03	03		
Evaluation Scheme	ISE-I	ISE-II	ESE	TA	TW	PR/OR	Total
	15	15	50	20	-	-	100
Pre-requisites (if any)	<ul style="list-style-type: none"> • Basic Knowledge of Differential Equation, Algebra, Trigonometry 						
Course Objectives	<ul style="list-style-type: none"> • To study the properties of matrix algebra and apply them to solve the system of algebraic equations. • Able to formulate and solve various engineering problems using differential and integral calculus and ability to work with advanced engineering mathematics. • Summarize concept of calculus to enhance ability of analyzing mathematical problems. • Comprehend the concept of vector space and solve problem using linear transformations. 						
Course Outcomes	<ul style="list-style-type: none"> • CO 1: Recall the concepts involved across the field of calculus and algebra. (Remember) • CO 2: Understand the conceptual variations to apply it in a various problem. (Understand) • CO 3: Apply appropriate technique to solve engineering problem. (Apply) • CO 4: Analyze engineering problems effectively with appropriate method. (Analyze) 						





Unit No.	Course Content	Hours
I	Matrix Algebra Introduction to determinant and matrices, System of linear equations, Rank of Matrix, Eigen values, Eigen Vector, Cayley-Hamilton Theorem, Inverse of a matrix, Gauss elimination, Gauss-Jordan elimination.	6
II	Differential Calculus Limit, Continuity, Types of discontinuity, Successive differentiation, Rolle's Theorem, LMVT, CMVT, Maxima and Minima.	6
III	Integral Calculus Definite and improper integrals, Beta-Gamma function and its properties, double-triple integral, change of variables, applications.	6
IV	Ordinary Differential Equations First order ODEs, Formation of differential equations, Exact, Linear, and Bernoulli's equations, ODEs of higher order, Homogeneous linear ODEs of higher order, Homogeneous linear ODEs with constant coefficients, Nonhomogeneous ODEs, Rules for finding C.F. and P.I., Method of Variation of Parameters.	6
V	Partial Differential Equations Formation of first and second order equations, Solution of first and second order linear and non-linear equations, Homogeneous linear PDEs of higher order with constant coefficients, Heat and Wave equation, Euler's Theorem, Jacobian.	6
VI	Vector Space and Linear Transformation Vector Space, Subspace, Linear Combination, LI – LD Set, basis, dimension, Linear transformations (maps), range and kernel of a linear map, Dimension Theorem, Inverse of a linear transformation.	6
Text Books		
1.	B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi (1965)	
2.	Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons. (1962)	
3.	B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi. (2007)	
Reference Books		
	C. R. Wylie, "Advanced Engineering Mathematics", McGraw Hill Publication, New Delhi. (2003)	
	Shanti Narayan, "Differential Calculus" S. Chand and company, New Delhi. (1942)	



H. K. Dass, “Advanced Engineering Mathematics”, S. Chand Publishing. (2007)
M. D. Greenberg, “Advanced Engineering Mathematics”, Pearson Education. (1998)

Web Links and Video Lectures (E-Resources)

1. NPTEL Course on Basic Calculus <https://archive.nptel.ac.in/courses/111/106/111106146/>
2. NPTEL Course on Integral and Vector Calculus <https://archive.nptel.ac.in/courses/111/105/111105122/>

Activity Based Learning (Suggested Activities in Class)

1. Flipped Classroom
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning.
4. Quizzes/Assignment

Mapping of Course Outcomes with Program Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1		-	-	-	-	-	-	-	-	2
CO2	3	2		-	-	-	-	-	-	-	-	2
CO3	3	2		-	-	-	-	-	-	-	-	2
CO4	3	3		-	-	-	-	-	-	-	-	2
Avg	3	2		-	-	-	-	-	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes

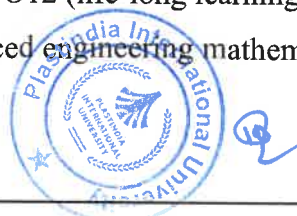
CO No.	PSO 1	PSO 2	PSO 3
CO 1	1	-	-
CO 2	2	-	-
CO 3	2	-	-
CO 4	3	-	-
Avg.	2	-	-

Correlation Level

- Slightly Low: 1
- Moderately (Medium): 2
- Substantially (Strong): 3

CO-PO-PSO Mapping Justification

- CO1 (Recall the fundamental concepts): Strongly relates to PO1 (Engineering knowledge), slightly to PO2 (problem solving), and moderately to PO12 (life-long learning). It slightly supports PSO1 (understanding fundamentals of advanced engineering mathematics).





- CO2 and CO3 (Describe variations in methods): Strongly maps to PO1, moderately to PO2 and PO12 due to understanding the variations in the methods to apply, which moderately aligns with PSO1 as it builds foundational understanding for advanced engineering mathematics.
- CO4 (Observation of problems): Strongly aligns with PO1 and PO2 as it involves multiple observations to analyse and apply a particular method, and moderately with PO12 (lifelong learning) for personal growth.



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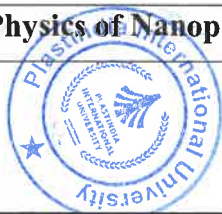
Year, Program, Semester	First Year B. Tech in Plastics and Polymer Engineering, Semester-I							
Course Code	BSC102							
Course Category	BSC (Basic Science Course)							
Course title	Engineering Physics (Theory)							
Teaching Scheme and Credits	L	T	P	Total Contact Hours		Total Credits		
	03	-	00	03		03		
Evaluation Scheme	ISE-I		ISE-II	ESE	TA	TW	PR/OR	Total
	15		15	50	20	-	-	100
Pre-requisites (if any)	10+2 level Physics							
Course Objectives	<ul style="list-style-type: none"> • Understand the fundamental concepts of crystal structure and learn the properties of superconducting materials. • Understand properties of electric and magnetic fields in the presence of static charge and current distributions. • To understand principles of ultrasounds and their applications • Students will learn the concepts related to Newton's laws of mechanics and their application to many particle systems, small oscillations • Understand the fundamental concepts of waves and classical optics with reference to the phenomena of interference and diffraction • Understand key concepts in Nanotechnology 							
Course Outcomes	<ul style="list-style-type: none"> • CO1: Recall the fundamental principles of solid-state physics, electromagnetism, quantum mechanics, ultrasound, photonics, and nanomaterials. (I Remember) • CO2: Understand the basics of semiconductors, magnetism, super conductivity, nano materials and their applications in engineering. (Understand) • CO3: Apply appropriate physical laws and mathematical models to solve problems in semiconductors, electromagnetism, quantum systems, optics, and nanoscale systems. (Apply) 							





	<ul style="list-style-type: none">CO4: Analyze the underlying mechanisms involved in Hall effect, electromagnetic induction, light propagation in fibres, and quantum confinement in nanomaterials (Analyze)
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Unit No.	Course Content	Hours
I	Solid State Physics Crystal structure of solids, Cubic crystals, Semiconductor Physics, Classification of solids, Types of semiconductors, effect of doping, mobility of charge carriers, conductivity, Hall effect.	6
II	Electromagnetism and Superconductivity Electricity and magnetism including Coulomb's Law, Continuity Equation, electric field, Gauss' Law, electric potential, Ohm's law, magnetic field, Ampere's Law, Faraday's Law and electromagnetic waves, The Meissner effect, perfect diamagnetic behaviour of superconductors. Superconducting magnetic energy storage, electromagnets.	6
III	Ultrasound Introduction, Production of Ultrasonic Waves, Magnetostriction Effect, Piezoelectric Effect, Piezoelectric Oscillator, Properties, measurement of velocity & Applications of Ultrasound	6
IV	Quantum Mechanics Introduction to quantum physics, Wave function and its physical admissibility, normalization of wave functions, Debroglie wavelength, wave particle duality- Davisson-Germer experiment, Heisenberg uncertainty principle, Schrodinger's equation and its application to free particle, particle in one dimensional box	6
V	Fundamentals of Photonics Laser: Interaction of radiation with matter, Einstein's coefficients A & B, Pumping, population inversion with Boltzmann equation, metastable state, optical cavity, characteristics of the laser, Applications of the laser. Fibre Optics: Principle of light transmission in optical fibre, its types, Numerical aperture, acceptance cone, Optical fibre communication system, and advantages.	6
VI	Physics of Nanoparticles	6





	Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods, top-down fabrication: ball milling, physical vapor deposition (PVD), Properties of nanoparticles (optical, electrical, mechanical, magnetic), applications of nanotechnology: Electronics (GMR effect and its application in read-write head of HDD), automobiles, environmental & energy, medical field (targeted drug delivery). Quantum Sensors and Applications	
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Text Books/Reference Books:

1.	M. N. Avadhanulu and P. G. Kshirsagar (2004), Engineering Physics, S. Chand Publication.
2.	R. K. Gaur and Gupta S. L (2012), Engineering Physics, Dhanapat Rai and Sons Publication.
3.	V. Rajendran (2011), Engineering Physics, Tata McGraw Hill Company Ltd, New Delhi
4.	Malik and Singh (2018), Engineering Physics, Tata Mc Graw Hill Company Ltd, New Delhi
5.	C. Kittel (20050, Introduction to Solid State Physics, Wiley and Sons.
6.	N.K. Bajaj (2021), The Physics of waves and Oscillations, Tata McGraw Hill Company Ltd, New Delhi
7.	Sulabha K. Kulkarni (2015), Nanotechnology: Principles and Practices, 3 rd Edition, Springer, New York

e-Books

1. Feynman Lecture series: <https://www.feynmanlectures.caltech.edu/>
2. Concepts of Modern Physics, Arthur Beiser:
https://nitsri.ac.in/Department/PHYSICS/Beiser_Modern_Physics.pdf

MOOC / NPTEL/YouTube Links:

- Lectures by Walter Lewin: <https://www.youtube.com/channel/UCiEHVhv0SBMpP75JbzJShqw>
- Quantum Mechanics Lecture Series by Prof. H. C. Verma:
https://www.youtube.com/playlist?list=PLWweJWdB_GuISnGkAafMpzzDBvTHg02At
- [nptel.ac.in](https://www.nptel.ac.in), [HyperPhysics Concepts](#), [The Physics Classroom](#), [Virtual Labs](#) | [Physical Sciences](#)

Activity Based Learning (Suggested Activities in Class):

1. Flipped Classroom
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning.
4. Quizzes/Assignment



**Mapping of Course Outcomes with Program Outcomes**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	2	-	-	1	-	-	-	-	-	-	2
CO 2	2	2	-	-	2	-	2	-	-	-	-	2
CO 3	3	1	2	-	2	-	-	-	-	-	-	2
CO 4	3	3	2	2	3	-	2	-	-	-	-	2
Avg.	2.75	2	2	2	2.0	-	2	-	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes

CO No.	PSO 1	PSO 2	PSO 3
CO 1	3	1	-
CO 2	3	2	-
CO 3	2	1	2
CO 4	2	2	2
Avg.	2.5	1.5	2

Correlation Level

- Slightly Low: 1
- Moderately (Medium): 2
- Substantially (Strong): 3

CO-PO-PSO Mapping Justification

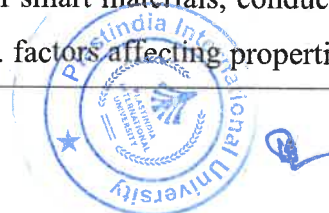
- CO1 The knowledge of Physics relevant to engineering is critical for converting ideas into technology — it correlates well with PO1, PO2, PO3 and PSO1.
- CO2 An understanding of Physics also helps engineers understand new innovations and improvements — mapping to PO1, PO3, PO3 and PSO2.
- CO3 Expands on application of basic principles of physics to solve engineering problems, and PO1, PO2, PSO2/PSO3.
- CO4 Establish a strong foundation to use several materials at various technical and engineering applications., which ties into PO12 and PSO3.





Year, Program, Semester	First Year B. Tech in Plastics and Polymer Engineering, Semester-I								
Course Code	ESC121								
Course Category	Engineering Science Course								
Course title	Materials Science and Engineering (Theory)								
Teaching Scheme and Credits	L	T	P	Total Contact Hours			Total Credits		
	03	-	-	03			03		
Evaluation Scheme	ISE-I		ISE-II		ESE	TA	TW	PR/OR	Total
	15		15		50	20	--	--	100
Pre-requisites (if any)	<ul style="list-style-type: none"> Structural Mechanics, Applied Physics I and II 								
Course Objectives	<ul style="list-style-type: none"> Selection of MOC for a given application, Maintenance and corrective measures for various engineering materials. 								
Course Outcomes	<ul style="list-style-type: none"> CO 1: Identify various types of materials, their internal structures, and bonding mechanisms. (Remember) CO 2: Classify the physical properties and imperfections present in solid materials. (Understand) CO 3: Demonstrate the fundamental techniques used in the processing of engineering materials. (Apply) CO 4: Examine the mechanisms of corrosion and degradation in materials from a scientific and engineering perspective. (Analyze) 								

Unit No.	Course Content	Hours
I	Introduction to Materials Introduction to materials, history, glass, and ceramics, metal, bonding, ferrous and non-ferrous metals, mild-steel, alloys, composite materials, superconducting materials, polymers, applications and behaviour of materials in in various sectors.	6
II	Structure-Property of Materials Structure of glass, tempered and toughened glass, process, mechanical, optical, surface properties of glass. structure and properties of smart materials, conductors, semiconductors, magnetic materials, and biomaterials. factors affecting properties.	6





III	Imperfection and Defects Crystal systems, amorphous and crystalline, crystal-glass, degree of crystallinity in metal, alloys and polymers, defects in materials, point defects, dislocations, line defects and surface defects in glass, metal and ceramics. Impacts of defects in properties and applications.	6
IV	Strength of Materials Concepts of stress and strain, displacement, types of stress and strain, stress-strain curve, bending (flexural) and impact strength, elasticity and plasticity, ideal plastic flow, strain hardening, fracture: modes of fracture and toughness in materials.	6
V	Material Processing Introduction to solidification, metal processing, casting, sintering, diffusion, smelting, electro-deposition, nanofabrication, sputtering, atomic layer deposition (ALD), chemical vapor deposition (CVD), physical vapor deposition. Introduction to polymer processing.	6
VI	Corrosion and Degradation of Materials Introduction, forms of corrosion, environmental effects, corrosion prevention, oxidation, corrosion of ceramic materials, degradation of materials, swelling and dissolution, bond rupture, weathering, and ageing.	6

Text Books

1	Materials Science and Engineering: An Introduction by William D. Callister, Jr., John Wiley & Sons, Inc., 2007, 7th Edition.
2	The Science and Engineering of Materials by Donald R. Askeland and Pradeep P. Phule, Thomson Learning, 2007, 5th Edition.
3	An Introduction to Materials Engineering and Science: For Chemical and Materials Engineers by Brian S. Mitchell, John Wiley & Sons, Inc., 2004.
4	Materials Science and Engineering – A First Course by V. Raghavan, Prentice Hall of India Private Limited, 2015, 6th Edition.
5	Materials Science and Engineering by G. S. Upadhyaya and Anish Upadhyaya, Viva Books Private Limited, 2006.
6	Materials Science and Engineering by L. H. Van Vlack, Pearson Education, 2001, 6th Edition.





7	Polymer Science by V. R. Gowariker, N. V. Viswanathan, and Jayadev Sreedhar, New Age International Publishers, 2015, 2nd Edition.
8	Textbook of Polymer Science by Fred W. Billmeyer, Wiley India Pvt. Ltd., 2007, 3rd Edition.
Reference Books	
1	Energy Materials by Duncan W. Bruce, Dermot O'Hare, and Richard I. Walton, Wiley, 2011, 1st Edition.
2	Fundamentals of Solar Cells: Photovoltaic Solar Energy Conversion by A. L. Fahrenbruch and R. H. Bube, Academic Press, 1983.
3	Materials and Processes in Manufacturing by J. T. Black and Ronald A. Kohser, John Wiley & Sons, 019, 12th Edition.
4	Functional Materials by S. Banerjee and A. K. Tyagi, Elsevier (Imprint), 2013, 1st Edition.
5	Handbook of Advanced Materials: Enabling New Designs by James K. Wessel, John Wiley & Sons, 2004.
6	Energy Materials by Duncan W. Bruce, Dermot O'Hare, and Richard I. Walton, Wiley, 2011, 1st Edition.

Mapping of Course Outcomes with Program Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	2	1	-	-	-	-	-	-	-	-	2
CO 2	3	3	2	2	-	-	-	-	-	-	-	2
CO 3	3	2	3	2	1	-	1	-	-	-	-	3
CO 4	2	2	3	2	2	1	3	2	-	-	-	3
Avg	2.75	2.25	2.25	2	1.5	1	2	2	-	-	-	2.5

Mapping of Course Outcomes with Program Specific Outcomes

CO No.	PSO 1	PSO 2	PSO 3
CO 1	3	-	-
CO 2	3	-	-
CO 3	2	2	3
CO 4	2	2	3
Avg.	2.5	2	3

Correlation Level

- Slightly Low: 1
- Moderately (Medium): 2
- Substantially (Strong): 3





CO-PO-PSO Mapping Justification

- CO1 is foundational and focuses on understanding material structure and properties — it correlates well with PO1, PO2, and PSO1.
- CO2 is structure and properties of materials relevant to knowledge and problem solution mapping to PO2, PO3, PO4 and PSO1.
- CO3 involves properties, manufacturing processes and techniques — strongly mapping to design and development, problem solving, and PSO2/PSO3.
- CO4 introduces corrosion and degradation, which ties into PO7 (Environment and sustainability).





Year, Program, Semester	First Year B. Tech in Plastics and Polymer Engineering, Semester-I							
Course Code	ESC122							
Course Category	ESC (Engineering Science Course)							
Course title	Integrated Electrical and Electronics Engineering (Theory)							
Teaching Scheme and Credits	L	T	P	Total Contact Hours		Total Credits		
	03	-	00	03		03		
Evaluation Scheme	ISE-I		ISE-II	ESE	TA	TW	PR/OR	Total
	15		15	50	20	-	-	100

Pre-requisites (if any) Knowledge of physics and mathematics taught at higher secondary level.

- Course Objectives
- To introduce the basics of electric circuits and analysis
 - To impart knowledge in the basics of working principles and application of electrical machines
 - To introduce and familiarize yourself with diodes and transistors analog devices and their characteristics.
 - To educate on the fundamental concepts of digital electronics
 - Prepare for next-level learning in design aspect

- Course Outcomes
- CO1: Recall fundamental electrical circuit laws, energy sources, and number systems relevant to digital electronics. (Remember)
 - CO2: Explain the operation of AC & DC electrical machines and identify the role of various power generation systems. (Understand)
 - CO3: Describe the working principles and characteristics of diodes, transistors, and operational amplifiers used in analog circuits. (Understand)
 - CO4: Apply circuit analysis techniques and digital logic to solve problems related to AC/DC circuits and basic digital systems. (Apply)

Unit No.	Course Content	Hours
I	Electrical Circuit Analysis Energy sources – Voltage and current sources, Current Division, Voltage Division. Star-Delta transformation. DC circuits analysis using mesh, Thevenin's	6





	& superposition theorem. Concept of Phase and Phase Difference. Phasor Representation, Rectangular and Polar representation of phasor. Analysis of single-phase series AC circuits consisting of RL, RC, RLC combinations. Concept of impedance, concept of active, reactive, apparent, complex power and power factor. Numerical, 3-phase balanced and unbalanced supply, star, and delta connections.	
II	Electric Machines Laws of electromagnetism, mmf, flux, and their relation, analysis of magnetic circuits. Single-phase transformer, basic concepts and construction features, EMF equation, transformation ratio, voltage regulation, losses, and efficiency. Constructional details of DC machine, induction machine and synchronous machine, Working principle of 3-Phase induction motor, EMF equation of 3-Phase induction motor, Concept of slip in 3-Phase induction motor, Explanation of Torque-slip characteristics of 3-Phase induction motor, Single phase AC machines - Types. Principle and working.	6
III	Sources of Electrical Power Introduction to Wind, Solar, Fuel cell, Tidal, Geothermal, Hydroelectric, Thermal-steam, diesel, gas, nuclear power plants; Concept of cogeneration, and distributed generation	6
IV	Electronic Components and Circuits Introduction to semiconductor devices, Diodes, V-I characteristics, Bipolar junction transistors (BJT) and their working, CC, CB & CE transistor configurations, modes of operation of BJT, DC biasing of BJT. Characteristics of operation amplifiers (OP-AMP) - application of Op Amps (inverting, non-inverting)	6
V	Digital Electronics Number systems used in digital electronics, decimal, binary, octal, hexadecimal, their complements, operation and conversion, floating point and signed numbers, Demorgan's theorem, AND, OR, NOT, NOR, NAND, EX-NOR EX-OR gates and their representation, truth table, half and full adder circuits, R-S flip flop, J-K flip flop.	6





VI	Sensors and Communication Systems Classification of sensors: Active /Passive Sensors, Selection Criteria/Characteristics of sensor. Motion Sensors (LVDT), Temperature Sensors (Thermocouple, RTD), Mechanical Sensors (Strain Gauge), Biosensors. Block diagram of IoT based Data Acquisition and Automation System.	6
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Text Books

1	Nagrath I.J. and D. P. Kothari (2001), Basic Electrical Engineering, Tata McGraw Hill.
3	Smarajit Ghosh (2015) Electrical Machines, Pearson Education, New Delhi.
4	Kulshreshtha D.C. (2009), Basic Electrical Engineering, Tata McGraw Hill.
5	Rajendra Prasad (2009), Fundamentals of Electrical Engineering, Prentice Hall, India
6	V. N. Mittal and Arvind Mittal (2019), Basic Electrical Engineering” McGraw Hill
7	Vincent DelToro (2011) Electrical engineering Fundamentals, PHI
8	R.P. Jain (2010), Modern Digital Electronics, 4th Edition, Tata McGraw Hill.
9	Thomas. L. Floyd (2015), Electronics Devices, 9th Edition, Pearson

NPTEL/SWAYAM Course

Sr. No.	NPTEL Course Name	Instructor	Host Institute
1	Basic Electric Circuits	Prof. Ankush Sharma	IIT Kanpur
2	Basic Electrical Circuits	Prof. Nagendra Krishnapura	IITM, Chennai
3	Fundamentals of Electrical Engineering	Prof. Debapriya Das	IIT, Kharagpur

- <https://nptel.ac.in/courses/117103063>
- <https://nptel.ac.in/courses/117103064>
- <https://archive.nptel.ac.in/courses/106/105/106105166/>

Web Links and Video Lectures (E-Resources)

- <https://nptel.ac.in/courses/108108076>
- <https://archive.nptel.ac.in/courses/108/105/108105155/>
- <https://nptel.ac.in/courses/108/101/108101091/>
- <http://www.youtube.com/watch?v=Kp-jS6NHsB8>
- E-Book:** . <https://www.pearson.com/en-us/subject-catalog/p/electronic-devices-electron-flow-version/P200000001048>

Activity Based Learning (Suggested Activities in Class):



1. Flipped Classroom
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning.
4. Quizzes/Assignment

Mapping of Course Outcomes with Program Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	–	–	–	–	–	–	–	–	1	–	1
CO2	3	2	–	–	–	1	1	–	–	1	–	2
CO3	2	2	3	–	2	–	–	–	1	2	1	2
CO4	3	2	3	–	3	1	1	–	–	1	–	2
Avg.	2.75	2.0	3.0	–	2.5	1.0	1.0	–	1.0	1.25	0.25	1.75

Mapping of Course Outcomes with Program Specific Outcomes

CO	PSO1	PSO2	PSO3
CO1	3	–	–
CO2	3	2	–
CO3	–	3	2
CO4	3	2	3
Avg.	3.0	2.33	2.5

Correlation Level

- Slightly Low: 1
- Moderately (Medium): 2
- Substantially (Strong): 3

CO-PO-PSO Mapping Justification

- CO1 Builds foundational understanding of polymer science concepts — it correlates well with PO1, PO10, PO12 and PSO1.
- CO2 Develops classification and analytical skills for polymers, promoting environmental and contextual awareness — mapping to PO1, PO2, PO6, PO7, PO10, PO12 and PSO1, PSO2, PSO3.
- CO3 Enhances visualization and application skills using drawing tools and standards — linked to PO1, PO2, PO3, PO5, PO9, PO10, PO11, PO12 and PSO2, PSO3.
- CO4 Applies design thinking and CAD tools to prototype polymer products — tying into PO1, PO2, PO3, PO5, PO10, PO12 and PSO1, PSO2, PSO3.





Year, Program, Semester	First Year B. Tech in Plastics and Polymer Engineering, Semester-I						
Course Code	ESC123						
Course Category	Engineering Science Course						
Course title	Engineering Graphics and Design (Theory)						
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits		
	03	-	-	03	03		
Evaluation Scheme	ISE-I	ISE-II	ESE	TA	TW	PR/OR	Total
	15	15	50	20	-	-	100
Pre-requisites (if any)	Knowledge of plane geometry and solid geometry						
Course Objectives	<ul style="list-style-type: none"> To develop basic graphic skills. To learn the engineering graphics standards. To develop skills in reading and interpretation of engineering drawings. To introduce Computer-Aided drafting tools 						
Course Outcomes	<ul style="list-style-type: none"> CO1: Identify basic concepts of BIS conventions and their application. (Remember) CO2: Interpret first angle and third angle projection system. (Understand) CO3: Construct orthographic projections of points, lines and planes. (Apply) CO4: Apply principles of projection and construct orthographic and isometric views of an object. (Apply) CO5: Develop a skill of visualization to understand and read the drawing. (Analyze) 						

Unit No.	Course Content	Hours
I	Introduction to Engineering Graphics Scope of Engineering Drawing in all Branches of Engineering, Introduction to Drawing Standards BIS-SP-46, Representative Fraction, Engineering Scales, Dimensioning Terms and Notations, Types of Lines used in Eng. Practice recommended by BIS (Bureau of Indian Standards) Principles of Engineering Graphics and their significance, usage of Drawing instruments, Conic sections, Cycloid, Involutes.	6





II	Projections of Points, lines & Planes Projection of Points and lines inclined to both planes (line in first quadrant only); Types of Projections - Oblique, Perspective, Orthographic and Isometric Projections; Projections of Points located in all four Quadrants; Projections of lines inclined to one of the Reference Plane and inclined to two Reference Planes; Projections of various planes Polygonal, Circular and Elliptical shape inclined to one of the Reference Plane and inclined to two Reference Planes; Concept of Auxiliary Plane of Projections.	6
III	Projections of Solids and Sections of Solids Classifications of basic Solids, Projections of Solids - right regular prism, pyramid, cone, cylinder, tetrahedron and cube inclined to one of the reference plane and inclined to two reference planes; frustum of prism, pyramid and cone inclined to one of the reference plane; types of cutting planes - auxiliary inclined plane, auxiliary vertical plane, horizontal cutting plane, profile cutting plane; sections of solids resting on H.P./V.P. and inclined to only one of the reference planes; sectional views, true shape of the sections	6
IV	Orthographic Projections Different types of lines, Selection of views, spacing of views, dimensioning and sections, Conversion of pictorial view into orthographic view including sectional orthographic view.	6
V	Isometric Projections Principles of Isometric Projection, Isometric scale, Isometric projections and Isometric views / drawings. Circles in isometric view. Isometric views of simple solids and objects.	6
VI	Introduction to Computer Aided Sketching Introduction to CAD software, Graphical User interface of CAD software, Selection of Drawing size and scale, Standard Toolbars, Menus, Tabs, navigational tools, Basic Commands to draw 2D objects, Co-ordinate system and planes, Viewing Commands.	6
Text Books		
1.	Engineering Drawing by N. D. Bhatt, V. M. Panchal, and P. R. Ingle, Charotar Publishing House, 2014, 53rd Edition.	





2.	Engineering Drawing and Graphics by K. Venugopal, New Age International Publishers, 2010, 5th Edition.
3.	Engineering Drawing by P. S. Gill, S. K. Kataria & Sons Publishers, 2013, Revised Edition.
Reference Books	
1	Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
2	Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, SciTech Publishers
3	Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4	Jain, Maheshwari, Gautam (2021), Engineering Graphics & Design, Khanna Book Publishing.

Alternative NPTEL/SWAYAM Course			
Sr. No.	NPTEL Course Name	Instructor	Host Institute
1.	Prof. Raja Ram Lakkaraju	IIT Kharagpur	Engineering Drawing and Computer Graphics
2.	Prof. Nihar Ranjan Patra	IIT Kanpur	Engineering Graphics
Useful web links			
1	https://nptel.ac.in/courses/112103019/National Programme on Technology Enhanced Learning (NPTEL) - Phase II Course Name: Engineering Drawing		
2	https://nptel.ac.in/courses/112/104/112104172/		
3	http://moodle.unishivaji.ac.in/course/search.php?search=engineering+graphics Moodle Services, Sivaji University, Kolhapur		
4	http://web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf		

Mapping of Course Outcomes with Program Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	1	2	1	-	-	-	-	-	-	-	1
CO 2	3	1	3	1	-	-	-	-	-	-	-	1
CO 3	3	1	3	2	2	-	-	-	-	-	-	1
CO 4	2	2	3	1	1	-	-	-	-	-	-	1
Avg.	2.75	1.25	2.75	1.25	1.66	-	-	-	-	-	-	1





Mapping of Course Outcomes with Program Specific Outcomes

CO No.	PSO 1	PSO 2	PSO 3
CO 1	3	-	-
CO 2	3	-	-
CO 3	2	2	3
CO 4	2	1	3
Avg.	2.5	1.5	3

Correlation Level

- Slightly Low: 1
- Moderately (Medium): 2
- Substantially (Strong): 3

CO-PO-PSO Mapping Justification

- CO1 The knowledge of Physics relevant to engineering is critical for converting ideas into technology — it correlates well with PO1, PO2, PO3 and PSO1.
- CO2 An understanding of Physics also helps engineers understand new innovations and improvements — mapping to PO1, PO3, PO5 and PSO2.
- CO3 Expands on application of basic principles of physics to solve engineering problems, and PO3, PSO2/PSO3.
- CO4 Establish a strong foundation to use several materials at various technical and engineering applications., which ties into PO12 and PSO3.





Year, Program, Semester	S.Y. B. Tech in Plastics and Polymer Engineering, Semester-III						
Course Code	HSSM131						
Course Category	HSSM (Humanities and Social Sciences including Management Courses)						
Course title	Universal Human Values (Theory)						
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits		
	02	-	-	02	02		
Evaluation Scheme	ISE-I	ISE-II	ESE	TA	TW	PR/OR	Total
	-	-	50	-	-	-	50
Pre-requisites (if any)	<ul style="list-style-type: none"> • Environmental Science or General Studies • English • Chemistry, Physics and Mathematics 						
Course Objectives	<ul style="list-style-type: none"> • To introduce the need, purpose, and significance of value education for holistic human development. • To enable students to understand the harmony in the self, family, society, and nature. • To develop sensitivity towards ethical human conduct, universal human values, and sustainable living. • To encourage self-exploration and reflection as tools for personal growth and responsible decision-making. • To foster awareness of the relationship between individual well-being and societal harmony. 						
Course Outcomes	<ul style="list-style-type: none"> • CO1: Recall key concepts related to human values, harmony, and ethical living. (Remember) • CO2: Describe the fundamental human aspirations and the concept of value-based living. (Understand) • CO3: Illustrate the interdependence between self, relationships, society, and nature for achieving harmony. (Understand) • CO4: Apply self-reflection to make responsible choices in personal and 						





Unit No.	Course Content	Hours
I	Introduction to Value Education Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations	4
II	Harmony in the Human Being Understanding Human Being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to Ensure Self-regulation and Health	4
III	Harmony in the Family and Society Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order	4
IV	Harmony in the Nature/Existence Understanding Harmony in the Nature, Interconnectedness, Self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence	4
V	Implications of the Holistic Understanding – a Look at Professional Ethics Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics	4
VI	Holistic Technologies and Value-Based Transition Holistic Technologies, Production Systems and Management Models – Typical Case Studies, Strategies for Transition towards Value-based Life and Profession	4



**Text Books**

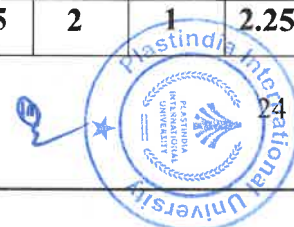
1	A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1	Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999
2	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3	The Story of My Experiments with Truth, M.K. Gandhi, Navajivan Publishing House, Ahmedabad, 1927.
4	Small is Beautiful, E.F. Schumacher, Blond & Briggs, London, 1973.
5	Slow is Beautiful, Cecile Andrews, New Society Publishers, Gabriola Island (British Columbia), 2006.
6	The Economy of Permanence, J.C. Kumarappa, Sarva Seva Sangh Prakashan, Varanasi, 1945.
7	Bharat Mein Angreji Raj, Pandit Sunderlal, Onkar Press, Allahabad, 1929.
8	Rediscovering India, Dharampal, SIDH (Society for Integrated Development of Himalayas), Mussoorie, 2003.
9	Hind Swaraj or Indian Home Rule, M.K. Gandhi, Navajivan Publishing House, Ahmedabad, 1938.
10	India Wins Freedom, Maulana Abul Kalam Azad, Sangam Books, Hyderabad, 1959.
11	Vivekananda: A Biography, Romain Rolland, Advaita Ashrama, Kolkata, 1931.

Mapping of Course Outcomes with Program Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	2	2	3	-	1	-	1
CO2	2	-	-	-	-	3	3	3	-	2	-	2
CO3	2	-	-	-	-	3	3	3	2	2	-	3
CO4	2	2	-	-	-	3	3	3	3	3	1	3
Avg	1.75	2	-	-	-	2.75	2.75	3	2.5	2	1	2.25





Mapping of Course Outcomes with Program Specific Outcomes

CO No.	PSO 1	PSO 2	PSO 3
CO 1	2	-	-
CO 2	3	-	-
CO 3	3	1	-
CO 4	3	2	1
Avg.	2.75	1.5	1

Correlation Level

- Slightly Low: 1
- Moderately (Medium): 2
- Substantially (Strong): 3

CO-PO-PSO Mapping Justification

- CO1 (Recall key concepts on human values and harmony): Relates to PO1 (fundamental knowledge), PO6 (societal responsibility), and PO8 (ethics). It moderately supports PSO1 (understanding fundamentals and sustainability).
- CO2 (Describe human aspirations and value-based living): Maps to PO1, PO6, PO7 (sustainability), and PO8 due to its focus on ethical and sustainable living. Strongly aligned with PSO1 as it builds foundational understanding.
- CO3 (Illustrate interdependence in self, society, and nature): Applies to PO6, PO7, PO8, PO9 (teamwork), and PO10 (communication), supporting interpersonal and ethical skills. Supports PSO1 strongly and PSO2 weakly through system-level comprehension.
- CO4 (Apply self-reflection for responsible choices): Requires PO6, PO7, PO8, PO9, PO10, and PO12 (lifelong learning) for professional ethics and personal growth. Weakly linked to PSO2 and PSO3 via ethical decision-making in professional contexts.





Year, Program, Semester	First Year B. Tech in Plastics and Polymer Engineering, Semester-I						
Course Code	BSC141						
Course Category	BSC (Basic Science Course)						
Course title	Engineering Physics (Lab)						
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits		
	-	-	2	02	01		
Evaluation Scheme	ISE-I	ISE-II	ESE	TA	TW	PR/OR	Total
	-	-	-	-	-	25	25
Pre-requisites (if any)	Physics Practical at Graduation level						
Course Objectives	<ul style="list-style-type: none"> • Conduct experiments to measure and analyze the properties of materials using ultrasonic and dielectric techniques • Investigate the behavior and characteristics of light through laser diffraction and fiber optics experiments. • Examine the photoelectric effect and semiconductor properties using photodiodes, LEDs, and laser diodes. • Employ various methods such as the four-probe technique and B-H curve tracing to study magnetic and electrical properties. 						
Course Outcomes	<ul style="list-style-type: none"> • CO1: Recall principles and functions of instruments used in modern physics experiments. (Remember) • CO2: Explain the physical concepts demonstrated through optical, electronic, and semiconductor experiments. (Understand) • CO3: Conduct experiments and determine key physical parameters using appropriate techniques. (Apply). • CO4: Analyze and interpret experimental data to compare device behaviour and material properties. (Analyze) 						
Sr. No.	List of Experiments						
1	To find velocity of sound in liquid medium using Ultrasonic Interferometer						
2	To determine wavelength of the given source						





3	To determine the value of Planck 's Constant using Light Emitting Diodes (LEDs).
4	To determine Dielectric Constant of given samples
5	To measure the Numerical aperture /Acceptance angle to measure attenuation
6	a) To Study I-V characteristics in forward bias b). To Study I-V characteristics under no illumination / different illuminations (intensities) in reverse bias
7	To determine the Energy Band Gap of a Semiconductor by using PN Junction Diode
8	To Study I-V characteristics of LED and Diode Laser. To Study P-I characteristics of LED and Diode Laser.
9	To determine the Fermi energy of copper.
10	To determine the value of Boltzmann Constant using a semiconductor diode

Reference Books

1	Donald A. Neamen, Semiconductor Physics and Devices: Basic Principles, 4 th Edition, McGraw Hill, 2027
2	K K Sharma, Optics, Principles and Applications, Elsevier, Academic Press, 2006
3	by M Born and E Wolf, Principles of Optics, 7 th Edition, Cambridge Press, 2013
4	Satya Prakash and Vinay Dua, Oscillations and Waves, Pragati Publishers, 2010

Mapping of Course Outcomes with Program Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	-	-	-	-	-	-	-	-	-	-	2
CO 2	3	2	-	-	-	-	-	-	-	2	-	2
CO 3	3	-	-	3	2	-	-	-	2	-	-	2
CO 4	2	3	2	3	-	-	2	-	-	-	-	3
Avg.	2.5	2.5	2	3	2	-	2	-	2	2	-	2.25



**Mapping of Course Outcomes with Program Specific Outcomes**

CO/PSO	PSO1	PSO2	PSO3
CO1	2	1	1
CO2	3	1	1
CO3	3	3	2
CO4	3	2	3
Avg.	2.75	1.75	1.75

Correlation Level

Slightly Low: 1

Moderately (Medium): 2

Substantially (Strong): 3

CO-PO-PSO Mapping Justification

- CO1 → PO1, PO12, PSO1: Fundamental understanding of tools and techniques in physical sciences supports polymer science learning
- CO2 → PO1, PO2, PSO1: Provides foundational physical principles important for polymer science applications.
- CO3 → PO1, PO4, PSO1, PSO2: Develops lab and practical skills relevant to processing, measurement, and analysis in polymers.
- CO4 → PO2, PO3, PSO1, PSO3: Correlates with analyzing and solving polymer-related technical challenges based on experimental observations.





Year, Program, Semester	First Year B. Tech in Plastics and Polymer Engineering, Semester-I						
Course Code	ESC142						
Course Category	Engineering Science Course						
Course title	Engineering Graphics and Design (Lab.)						
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits		
	-	-	02	02	01		
Evaluation Scheme	ISE-I	ISE-II	ESE	TA	TW	PR/OR	Total
	-	-	-	-	25	-	25
Pre-requisites (if any)	<ul style="list-style-type: none"> • Knowledge of plane geometry and solid geometry 						
Course Objectives	<ul style="list-style-type: none"> • The course is aimed at developing Basic Graphic skills. • To learn the engineering graphics standards. • To develop Skills in Reading and Interpretation of Engineering Drawings. • To introduce Computer-Aided Drafting tools 						
Course Outcomes	<ul style="list-style-type: none"> • Identify the basic concepts of BIS conventions and their application in engineering drawing. (Remember) • Interpret the principles of first angle and third angle projection systems used in technical graphics. (Understand) • Construct orthographic projections of points, lines, and planes using standard projection techniques. (Apply) • Develop orthographic and isometric views of objects based on projection principles. (Apply) 						

List of Experiment

1	Introduction to Engineering Graphics: Types of lines, Letterings, Drawing Symbols, Numberings, Dimensioning Terms and Notations, Title Block, Geometric Constructions etc.
2	Exercise Sheet on Engineering curves
3	Exercise Sheet on Projections of Points and lines
4	Exercise Sheet on Projections of planes
5	Exercise Sheet on Projections of solids
6	Exercise Sheet on Development of lateral surfaces of solids
7	Exercise Sheet on Orthographic projections





8	Exercise Sheet on Isometric projections
9	Demonstration of drafting software with commands

Mapping of Course Outcomes with Program Outcomes

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	–	–	–	–	–	–	–	–	2	–	2
CO2	3	2	–	–	–	–	–	–	–	2	–	–
CO3	3	–	3	–	–	–	–	–	–	2	–	–
CO4	3	–	3	–	2	–	–	–	–	2	–	–
Avg.	3	2	1.5	–	2	–	–	–	–	2	–	2

Mapping of Course Outcomes with Program Specific Outcomes

CO \ PSO	PSO1	PSO2	PSO3
CO1	3	–	–
CO2	3	–	–
CO3	–	3	–
CO4	–	3	3
Avg.	1.5	1.5	0.75

Correlation Level

- Slightly Low: 1
- Moderately (Medium): 2
- Substantially (Strong): 3

CO-PO-PSO Mapping Justification

- CO1 Understanding of BIS conventions and standards is essential for correct engineering documentation — it correlates well with PO1, PO10, PO12 and PSO1.
- CO2 Knowledge of first and third angle projection systems enables accurate interpretation of engineering views — mapping to PO1, PO2, PO10 and PSO1.
- CO3 The ability to construct projections of points, lines, and planes develops core technical drawing skills — linked to PO1, PO3, PO10 and PSO2.
- CO4 Applying projection principles to generate orthographic and isometric views builds a foundation for design and visualization — mapped to PO1, PO3, PO5, PO10 and PSO2, PSO3.





Year, Program, Semester	First Year B. Tech in Plastics and Polymer Engineering, Semester-I							
Course Code	ESC143							
Course Category	ESC (Engineering Science Course)							
Course title	Integrated Electrical and Electronics Engineering (Lab.)							
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits			
	-	-	2	02	01			
Evaluation Scheme	ISE-I	ISE-II	ESE	TA	TW	PR/OR	Total	
	-	-	-	-	-	25	25	
Pre-requisites (if any)	<ul style="list-style-type: none"> • Knowledge of physics and mathematics taught at higher secondary level. 							
Course Objectives	<ul style="list-style-type: none"> • To analyse AC and DC circuits • To understand the construction and working of various electrical machines and perform load tests to find its efficiency. • To Implement analog and digital circuits. 							
Course Outcomes	<ul style="list-style-type: none"> • CO 1: Measure electrical parameters and waveforms of machines and components using appropriate test equipment. (Understand) • CO 2: Verify fundamental circuit theorems and analyze the steady-state behavior of AC and DC electrical circuits. (Apply) • CO 3: Demonstrate the working principles of basic electronic and digital logic circuits using datasheets and truth tables. (Apply) • CO 4: Determine performance characteristics of electrical machines and transformers under varying load conditions. (Analyze) 							

List of Experiment

PART-A: List of Experiments

1. To verify KVL and Superposition theorem and Thevenin's theorem.
2. To measure steady state response of series RL and RC circuits on AC supply and observations of voltage and current waveforms on storage oscilloscope
3. To derive resonance frequency and analyse resonance in series RLC circuit.





4. Speed control of DC shunt motor by armature voltage and flux control method.
5. Load test on three phase induction motor.
6. Direct Load test on single phase transformer.
7. V-I characteristics of:
 - a) P-N Junction Diode (Study the datasheet of typical PN junction diode 1N 400X)
 - b) Zener Diode (Study the datasheet of typical Zener diode 1N 4148)
8. Test and verify the truth tables of:
 - a) Basic and Universal Gates (Study the data sheet of respective ICs)
 - b) Half / Full Adder
 - c) RS/JK/T/D flip flop

PART-B: Assignments (Any Two)

1. Assignment on Electrical circuit analysis
2. Assignment on Electric machines
3. Assignment on Electronic Components and Circuits
4. Assignment on Digital Electronics

Suggested Learning Resources (Text / Reference Books)

1	L. S. Bobrow (2011), Fundamentals of Electrical Engineering, Oxford University Press
2	Edward Hughes (2016), Electrical Technology”, ELBS, Pearson Education
3	Nagrath I.J. and D. P. Kothari (2001), Basic Electrical Engineering, Tata McGraw Hill.
4	Smarajit Ghosh (2015) Electrical Machines, Pearson Education, New Delhi.
5	Kulshreshtha D.C. (2009), Basic Electrical Engineering, Tata McGraw Hill.
6	Rajendra Prasad (2009), Fundamentals of Electrical Engineering, Prentice Hall, India
7	Hayt and Kimberly, Engineering Circuit Analysis, Tata McGraw Hill.
8	Smarajit Ghosh (2015) Electrical Machines, Pearson Education, New Delhi.
9	Vincent DelToro (2011) Electrical engineering Fundamentals, PHI
10	R.P. Jain (2010), Modern Digital Electronics, 4th Edition, Tata McGraw Hill.

Web Links and Video Lectures (E-Resources)

3. <https://nptel.ac.in/courses/108108076>
4. <https://archive.nptel.ac.in/courses/108/105/108105155/>





5. <https://nptel.ac.in/courses/108/101/108101091/>

6. <http://www.youtube.com/watch?v=Kp-jS6NHsB8>

Activity Based Learning (Suggested Activities in Class)

1. Flipped Classroom
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning.
4. Quizzes/Assignment

Mapping of Course Outcomes with Program Specific Outcomes

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	–	–	–	–	–	–	–	–	2	–	–
CO2	3	2	–	–	–	–	–	–	–	2	–	1
CO3	3	–	2	–	–	–	–	–	–	2	–	–
CO4	3	2	2	–	–	–	–	–	–	2	–	2
Avg.	3	2	2	-	-	-	-	-	-	2	-	1.5

Mapping of Course Outcomes with Program Specific Outcomes

CO No.	PSO 1	PSO 2	PSO 3
CO 1	2	-	-
CO 2	3	2	-
CO 3	-	2	2
CO 4	-	3	2
Avg.	2.5	2.33	2

Correlation Level

- Slightly Low: 1
- Moderately (Medium): 2
- Substantially (Strong): 3

CO-PO-PSO Mapping Justification

- CO1 Measuring parameters and waveforms builds instrumentation and observation skills — mapped to PO1, PO10 and PSO1.
- CO2 Verifying theorems and steady-state behavior promotes analytical reasoning and circuit understanding — mapped to PO1, PO2, PO10, PO12 and PSO1, PSO2.





- CO3 Demonstrating electronic and digital logic circuits improves experimental analysis and integration skills — linked to PO1, PO3, PO10 and PSO2, PSO3.
- CO4 Determining machine performance characteristics through tests develops applied analysis and reporting abilities — mapped to PO1, PO2, PO3, PO10, PO12 and PSO2, PSO3.





Year, Program, Semester	First Year B. Tech in Plastics and Polymer Engineering, Semester-I						
Course Code	VSEC132						
Course Category	Engineering Science Course						
Course title	Design Thinking and Innovation (Lab)						
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits		
	-	-	02	02	01		
Evaluation Scheme	ISE-I	ISE-II	ESE	TA	TW	PR/OR	Total
	-	-	-	-	25	-	25
Pre-requisites (if any)	<ul style="list-style-type: none"> • Knowledge of Basic Science and Mathematics 						
Course Objectives	<ul style="list-style-type: none"> • To explain the concept of design thinking for product and service development • To explain the fundamental concept of innovation and design thinking • To discuss the methods of implementing design thinking in the real world. 						
Course Outcomes	<ul style="list-style-type: none"> • CO 1: Identify user needs, pain points, and contexts using empathy mapping and persona development. (Remember) • CO 2: Generate creative ideas and design directions using ideation, brainstorming, and mind mapping techniques. (Create) • CO 3: Develop prototypes that communicate core product concepts and address user-centered design goals. (Apply) • CO 4: Demonstrate iterative testing, analysis, and refinement by conducting user testing and journey mapping. (Analyze) 						

Sr. No.	List of Experiment
1	To utilize Empathy Mapping for gaining insights into user needs and behaviours for informed, user-centred design decisions.
2	To create detailed user personas that represent the target audience's characteristics, needs, and behaviours, enabling a deeper understanding of user requirements and guiding the design process effectively.





3	To explore and apply various ideation techniques for generating innovative and diverse solutions, fostering creativity, and addressing user needs effectively in the design thinking process.
4	To explore and apply collaborative brainstorming and mind mapping techniques to generate diverse ideas, encourage creative thinking, and organize complex information, fostering innovation and expanding the boundaries of solution development.
5	To develop tangible prototypes that represent initial design concepts, facilitating the exploration, communication, and validation of ideas in alignment with user needs and design objectives.
6	To understand and apply rapid prototyping techniques by creating a 3D-printed part, demonstrating the process of transforming designs into physical models quickly and efficiently.
7	To understand the process of user testing and its significance in product development by conducting user testing sessions, gathering feedback, and analyzing insights to propose actionable improvements for a given prototype or product.
8	To understand the process of Journey Mapping and its significance in analyzing user experiences by visualizing and evaluating the steps users go through while interacting with a product, service, or system.
9	Design Sprint: Rapid Problem Solving
10	Innovative Problem-Solving: Applying Design Thinking in Real-World Scenarios

Conduct of Laboratory Sessions

The following activities will be planned

- a) Brain teasers (aka Puzzle Busters, to be solved individually)
- b) Cartoon captions (small teams)
- c) TRIZ, a systematic ideation method, reading (individual)
- d) Book readings and discussions (small teams)
- e) Small teams' presentations on innovation:(1) innovative individual, (2) innovative company, (3) innovative movie / game, (4) sustainable innovation, (5) innovation in business, (6) innovation in art,





(7) innovation in architecture, (8) innovative nation, (9) innovation in science, and (10) innovation in engineering.

- f) Large groups hands-on projects
- g) Eight-dimensional (8D) ideation method examples
- h) Large teams' videos.
- i) Students also will be taken to the **workshop** to experience some kind of hands-on training to make carpentry, metal or smithy job.

Reference Books

1.	Lockwood, T., & Papke, E. (2010). Design Thinking: Integrating Innovation, Customer Experience, and Brand Value. Allworth Press.
2.	Lewrick, M., Link, P., & Leifer, L. (2018). The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems. Wiley.
3.	Plattner, H., Meinel, C., & Leifer, L. (Eds.). (2020). Design Thinking Research: Building Innovation Eco-Systems (Understanding Innovation). Springer.
4.	Brown, T. (2009). Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation. Harper Business.
5.	Ramanathan, U., & Seth, R. (Eds.). (2018). Social Internship and Sustainable Community Development in India: Concepts, Strategies, and Best Practices. Springer.

Important web links

1.	Stanford d.school - https://dschool.stanford.edu/
2.	IDEO U - https://www.ideo.com/

CO-PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	–	–	–	1	1	2	2	2	–	2
CO2	2	2	3	–	2	–	–	–	2	2	–	2
CO3	2	–	3	–	3	–	–	–	–	2	–	2
CO4	2	2	3	2	2	–	–	–	2	3	–	3
Avg.	2	1	3	2	2.33	1	1	2	2	2.25	-	2.25





CO-PSO Mapping

CO \ PSO	PSO1	PSO2	PSO3
CO1	2	2	–
CO2	–	3	2
CO3	–	2	3
CO4	2	2	3
Avg.	1.0	2.25	2.0

Correlation Level

- Slightly Low: 1
- Moderately (Medium): 2
- Substantially (Strong): 3

CO-PO-PSO Mapping justification

- CO1 Understanding user needs through empathy and persona creation is foundational to design thinking — it correlates well with PO1, PO2, PO6, PO7, PO8, PO9, PO10, PO12 and PSO1, PSO2.
- CO2 Generating creative ideas using ideation and mind mapping techniques fosters innovation and collaborative thinking — mapping to PO1, PO2, PO3, PO5, PO9, PO10, PO12 and PSO2, PSO3.
- CO3 Developing functional and visual prototypes helps translate abstract concepts into tangible outputs — linked to PO1, PO3, PO5, PO10, PO12 and PSO2, PSO3.
- CO4 Iterative testing and journey mapping refine design outcomes and promote user-centered innovation — mapped to PO1, PO2, PO3, PO4, PO5, PO9, PO10, PO12 and PSO1, PSO2, PSO3.





Year, Program, Semester	First Year B. Tech in Plastics and Polymer Engineering, Semester-I				
Course Code	HSSM133				
Course Category	HSSM (Humanities and Social Sciences including Management Courses)				
Course title	Yoga and Meditation (Practice – Non-Credit Mandatory Course)				
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits
	9	-	2	02	-
Pre-requisites (if any)	Basic physical fitness and flexibility for yoga postures (asanas) and meditation practices. Open-mindedness, willingness to learn, and a commitment to regular practice and self-reflection are essential.				
Course Objectives	<ul style="list-style-type: none"> • Gain a comprehensive understanding of yoga and meditation principles and practices for holistic well-being. • Develop practical skills to incorporate yoga and meditation into daily life for stress reduction and emotional balance. • Explore the scientific basis and applications of yoga and meditation in diverse contexts. • Foster personal growth and self-awareness through regular practice, integrating yoga and meditation as a lifelong journey. 				
Course Outcomes	<ul style="list-style-type: none"> • CO 1: Develop a strong foundation in yoga and meditation techniques and principles. • CO 2: Cultivate mindfulness and self-awareness through regular practice. • CO 3: Enhance physical flexibility, strength, and overall well-being. • CO 4: Apply yoga and meditation practices to reduce stress and promote mental and emotional balance. 				

Sr. No.	Course Content
I.	Introduction to Yoga and Meditation: a) Overview of yoga and its origins b) Introduction to meditation techniques and benefits
II.	Foundations of Yoga Practice:



	a) Understanding yoga asanas (poses) and their alignment b) Pranayama techniques for breath control and energy regulation
III.	Exploring Meditation Techniques: a) Mindfulness meditation and its practice b) Guided visualization and relaxation techniques
IV.	Yoga for Physical Health and Well-being: a) Yoga for flexibility and strength b) Yoga for stress reduction and relaxation
V.	Yoga Philosophy and Lifestyle: a) Introduction to the philosophy of yoga b) Applying yoga principles to daily life and relationships
VI.	Advanced Practices and Integration: a) Advanced yoga asanas and sequences b) Integrating yoga and meditation into a holistic lifestyle

Reference Books

1	Iyengar, B.K.S. Light on Yoga: The Bible of Modern Yoga. HarperCollins, 2001.
2	Khalsa, Gurucharan Singh. Kundalini Yoga: The Flow of Eternal Power. TarcherPerigee, 1999.
3	Lasater, Judith Hanson. Relax and Renew: Restful Yoga for Stressful Times. Rodmell Press, 2011.
4	Saraswati, Swami Satyananda. Asana, Pranayama, Mudra, Bandha. Bihar School of Yoga, 2008.
5	Satchidananda, Swami. The Yoga Sutras of Patanjali. Integral Yoga Publications, 2012.
6	Zinn, Jon Kabat. Wherever You Go, There You Are: Mindfulness Meditation in Everyday Life. Hyperion, 2005.

Important web links

1.	Yoga Journal: www.yogajournal.com
2.	Headspace: www.headspace.com
3.	The International Sivananda Yoga Vedanta Centres: www.sivananda.org
4.	Insight Timer: www.insighttimer.com