Pimpri Chinchwad Education Trust's

PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE 411044

(An Autonomous Institute Approved by AICTE and Affiliated to SPPU, Pune)

Curriculum Structure and Syllabus

of

First Year B. Tech. E & TC Engineering

(Regulations 2026)

Effective from Academic Year 2026-27

Institute Vision

To be one of the top 100 Engineering Institutes of India in coming five years by offering exemplarily Ethical, Sustainable and Value Added Quality Education through a matching ecosystem for building successful careers.

Institute Mission

1. Serving the needs of the society at large through establishment of a state-of-art Engineering Institute.
2. Imparting right Attitude, Skills, and Knowledge for self-sustenance through Quality Education.
3. Creating globally competent and Sensible engineers, researchers and entrepreneurs with an ability to think and act independently in demanding situations.

EOMS Policy

"We at PCCOE are committed to offer exemplarily Ethical, Sustainable and Value Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders.

We shall strive for technical development of students by creating globally competent and sensible engineers, researchers and entrepreneurs through Quality Education.

We are committed for Institute's social responsibilities and managing Intellectual property.

We shall achieve this by establishing and strengthening state-of-the-art Engineering Institute through continual improvement in effective implementation of Educational Organizations Management Systems (EOMS)."

Course Approval Summary

Board of Studies - Department of Applied Sciences and Humanities:

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS chairman
1.	Linear Algebra & Univariate Calculus	BSH31BS01	11	
2.	Linear Algebra & Univariate Calculus – Laboratory	BSH31BS02	12	
3.	Engineering Chemistry	BSH31BS08	14	
4.	Engineering Chemistry Laboratory	BSH31BS09	17	
5.	Constitution of India	BSH31VE01	23	
6.	Indian Knowledge System	BSH31IK01	25	
7.	Communicative English	BSH31AE01	27	
8.	Life Skills 1	BSH31CC01	30	
9.	Multivariate Calculus	BSH32BS12	34	
10.	Multivariate Calculus laboratory	BSH32BS13	36	
11.	Engineering Physics	BSH32BS03	38	
12.	Engineering Physics Laboratory	BSH32BS04	40	
13.	Universal Human Values	BSH32VE02	50	
14.	Professional Eng/Ger/Jap/Business storytelling)	BSH32AE02/03 /04/05	52/54/56 /58	
15.	Life Skills 2	BSH32CC02	60	

Board of Studies - Department of E & TC Engineering

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS chairman
1.	Fundamentals of Electrical Engineering	BET31ES01	18	
2.	Programming for Problem Solving	BET31ES02	23	
3.	Electronic Devices	BET32ES01	41	
4.	Python Programming	BET32ES02	43	
5.	Sensors and Transducers	BET32PC01	45	
6.	Electronics Skill Lab. (DIY)	BET32VS01	47	

Approved by Academic Council:

Chairman, Academic Council
Pimpri Chinchwad College of Engineering

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CURRICULUM FRAMEWORK

(2026 Course)

LIST OF ABBREVIATIONS

Sr. No.	Abbreviation	Type of Course
1	BSC	Basic Science Course
2	ESC	Engineering Science Course
3	PCC	Programme Core Course
4	PEC	Programme Elective Course
5	MDM	Multidisciplinary Minor
6	OEC	Open Elective Course
7	VSEC	Vocational and Skill Enhancement Course
8	AEC	Ability Enhancement Course
9	EEM	Entrepreneurship/Economics/Management Course
10	IKS	Indian Knowledge System
11	VEC	Value Education Course
12	ELC	Experiential Learning Courses
13	LLC	Liberal Learning Courses

COURSE WISE CREDIT DISTRIBUTION

Sr. No.	Type of Course	No. of Courses	Total Credits	
			NO.	%
1	Basic Science Course	8	14	35
2	Engineering Science Course	4	12	30
3	Program Core Course	1	2	5
4	Vocational and Skill Enhancement Course	1	2	5
5	Value Education Course	2	4	10
6	Ability Enhancement Course	2	2	5
7	Indian Knowledge System	1	2	5
8	Co-Curricular Courses	2	2	5
Total		**21**	**40**	**100**

SEMESTER-WISE COURSE DISTRIBUTION

Course Distribution: Semester Wise										
Sr. No.	**Type of Course**	**No. of Courses / Semester**								**Total**
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
1.	Basic Science Course	4	4	-	-	-	-	-	-	8
2.	Engineering Science Course	2	2	-	-	-	-	-	-	4
3.	Program Core Course	-	1	-	-	-	-	-	-	1
4.	Vocational and Skill Enhancement Course	-	1	-	-	-	-	-	-	1
5.	Value Education Course	1	1	-	-	-	-	-	-	2
6.	Ability Enhancement Course	1	1	-	-	-	-	-	-	2
7.	Indian Knowledge System	1	-	-	-	-	-	-	-	1
8.	Co-Curricular Courses	1	1	-	-	-	-	-	-	2
	Total	**10**	**11**		-	-	-	-	-	**21**

SEMESTER-WISE CREDIT DISTRIBUTION

Credit Distribution: Semester Wise										
Sr. No.	**Type of Course**	**No. of Credits / Semester**								**Total**
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
1	Basic Science Course	7	7	-	-	-	-	-	-	14
2	Engineering Science Course	7	5	-	-	-	-	-	-	12
3	Program Core Course	-	2	-	-	-	-	-	-	2
4	Vocational and Skill Enhancement Course	-	2	-	-	-	-	-	-	2
5	Value Education Course	2	2	-	-	-	-	-	-	4
6	Ability Enhancement Course	1	1	-	-	-	-	-	-	2
7	Indian Knowledge System	2	-	-	-	-	-	-	-	2
8	Co-Curricular Courses	1	1	-	-	-	-	-	-	2
	Total	**20**	**20**							**40**

Curriculum Structure
Semester I & II

CURRICULUM STRUCTURE

First Year B. Tech E & TC Engineering (Academic Regulations 2026)																		
(With effect from Academic Year 2026-27)																		
Semester I																		
Course Type	**Course Code**	**Course Name**	**Credit Scheme**				**Teaching Scheme (Hrs./Week)**					**Evaluation Scheme and Marks**						
			L	**P**	**T**	**Total**	**L**	**P**	**T**	**O**	**Total**	**FA**		**SA**	**TW**	**PR**	**OR**	**Total**
												FA1	**FA2**					
BSC	BSH31BS01	Linear Algebra & Univariate Calculus	2	-	-	2	2	-	-	1	3	10	10	30	-	-	-	50
BSC	BSH31BS02	Linear Algebra & Univariate Calculus - Laboratory	-	1	-	1	-	2	-	-	2	-	-	-	50	-	-	50
BSC	BSH31BS08	Engineering Chemistry	3	-	-	3	3	-	-	1	4	20	20	60	-	-	-	100
BSC	BSH31BS09	Engineering Chemistry Laboratory	-	1	-	1	-	2	-	-	2	-	-	-	50	-	-	50
ESC	BET31ES01	Fundamentals of Electrical Engineering	3	1	-	4	3	2	-	1	6	20	20	60	25	-	-	125
ESC	BET31ES02	Programming for Problem Solving	2	1	-	3	2	2	-	1	5	10	10	30	25	-	-	75
VEC	BSH31VE01	Constitution of India	2	-	-	2	2	-	-	-	2	25	25	-	-	-	-	50
IKS	BSH31IK01	Indian Knowledge System	2	-	-	2	2	-	-	-	2	25	25	-	-	-	-	50
AEC-I	BSH31AE01	Communicative English	-	1	-	1	-	2	-	-	2	-	-	-	30	-	20	50
CC	BSH31CC01	Life Skills 1	-	1	-	1	-	2	-	-	2	-	-	-	50	-	-	50
		Total	**14**	**6**	**0**	**20**	**14**	**12**	**0**	**4**	**30**	**110**	**110**	**180**	**230**	**0**	**20**	**650**

L- Lecture, **P**- Practical, **T**- Tutorial, **O**- Other i.e. self-directed learning, (self- study), FA**-**Formative Assessment, **SA**-Summative Assessment, **TW**-Term Work, **OR**-Oral, **PR**-Practical

CURRICULUM STRUCTURE

First Year B. Tech E & TC Engineering (Academic Regulations 2026)																		
(With effect from Academic Year 2026-27)																		
Semester II																		
Course Type	**Course Code**	**Course Name**	**Credit Scheme**				**Teaching Scheme (Hrs./Week)**					**Evaluation Scheme and Marks**						
			L	**P**	**T**	**Total**	**L**	**P**	**T**	**O**	**Total**	**FA**		**SA**	**TW**	**PR**	**OR**	**Total**
												FA 1	**FA 2**					
BSC	BSH32BS12	Multivariate Calculus	2	-	-	2	2	-	-	1	3	10	10	30	-	-	-	50
BSC	BSH32BS13	Multivariate Calculus laboratory	-	1	-	1	-	2	-	-	2	-	-	-	50	-	-	50
BSC	BSH32BS03	Engineering Physics	3	-	-	3	3	-	-	1	4	20	20	60	-	-	-	100
BSC	BSH32BS04	Engineering Physics Laboratory	-	1	-	1	-	2	-	-	2	-	-	-	50	-	-	50
ESC	BET32ES01	Electronic Devices	2	1	-	3	2	2	-	1	5	10	10	30	25	-	-	75
ESC	BET32ES02	Python Programming	1	1	-	2	1	2	-	1	4	10	10	-	30	-	-	50
PCC	BET32PC01	Sensors and Transducers	2	-	-	2	2	-	-	1	3	10	10	30	-	-	-	50
VSEC	BET32VS01	Electronics Skill Laboratory (DIY)	-	2	-	2	-	4	-	-	4	-	-	-	100	-	-	100
VEC	BSH32VE02	Universal Human Values	2	-	-	2	2	-	-	-	2	25	25	-	-	-	-	50
AEC	BSH32AE02/ 03/04/05	(Professional Eng./Ger/Jap/Business storytelling)	-	1	-	1	-	2	-	-	2	-	-	-	30	-	20	50
CC	BSH32CC02	Life Skills 2	-	1	-	1	-	2	-	-	2	-	-	-	50	-	-	50
		Total	**12**	**8**	**0**	**20**	**12**	**16**	**0**	**5**	**33**	**85**	**85**	**150**	**335**	**0**	**20**	**675**

L-Lecture, **P**-Practical, **T**-Tutorial, **O**- Other i.e. self-directed learning, (self- study), FA**-**Formative Assessment, **SA**-Summative Assessment, **TW**-Term Work, **OR**-Oral, **PR**-Practical

Note: Refer separate document Exit Policy (If required)

Curriculum

Semester I

Program:	B. Tech. (E &TC)					Semester: I		
Course:	Linear Algebra & Univariate Calculus					Code:	BSH31BS01	
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	CIE		SA	Total
					FA1	FA2		
2	2	-	-	1	10	10	30	50

Prior knowledge of: 1. Elementary Mathematics, 2. Elementary Calculus.

Course Objectives: This course aims at enabling students,

1. To strengthen the concept of univariate calculus and mathematical modelling of physical systems using ordinary differential equations.
2. To get acquainted with advanced techniques for solving problems related to calculus and ordinary differential equations.

Course Outcomes: After learning the course, the students should be able to:

1. Apply the concept of linear algebra to the system of linear equations, linear dependence of vectors, eigenvalues, and eigenvectors.
2. Use successive differentiation in indeterminate forms, Taylor's and Maclaurin's expansions.
3. Solve first-order differential equations and higher-order linear differential equations.
4. Apply first-order differential equations and higher-order linear differential equations to solve problems involving growth and decay, electrical circuits, and one-dimensional heat flow.

Detailed Syllabus

Unit	Description	Duration [Hrs]
I	Matrices: Rank, system of linear equations with applications in electrical circuits, linear dependence and independence, linear transformations, eigenvalues, and eigenvectors.	8
II	Differential Calculus: exponential indeterminate forms, Taylor's series, Maclaurin's series, successive differentiation, and Leibnitz's theorem.	7
III	Ordinary Differential Equations: Exact differential equations and differential equations reducible to exact form. Applications: Growth and decay, Kirchoff's law of electrical circuits (L-R and R-C circuits), and one-dimensional conduction of heat (steady state).	8
IV	Linear Differential Equations: Linear differential equation of nth order with constant coefficients, General method, Shortcut methods, Method of variation of parameters, Application of linear differential equations in engineering, viz., mass-spring system, electrical circuits, etc.	7
	Total	**30**

Text Books:

1. Higher Engineering Mathematics by B.V. Ramana , 34e, Tata McGraw-Hill.
2. Advanced Engineering Mathematics, by Peter V. O'Neil, 7e, Thomson Learning.

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig, 9e, Wiley Eastern Ltd.
2. Advanced Engineering Mathematics by S.R.K. Iyengar, Rajendra K. Jain, 4e, Alpha Science International, Ltd.
3. Advanced Engineering Mathematics by M. D. Greenberg, , 2e, Pearson Education.
4. Higher Engineering Mathematics by B. S. Grewal, 43e, Khanna Publication, Delhi

e-sources:

1. NPTEL Course lectures links:https://www.youtube.com/watch?v=4QFsiXfgbzM&list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpI5

Program:	B. Tech. (E & TC)					Semester: I	
Course:	Linear Algebra & Univariate Calculus Laboratory					Code:	BSH31BS02
Credits	Teaching Scheme (Hrs. /Week)			Evaluation Scheme and Marks			
	Theory	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	50	-	-	50

Prior knowledge:
1. Elementary Algebra.
2. Elementary Calculus

Course Objectives: This course aims to enable students,
1. Apply open-source software to solve engineering problems involving matrices, differential calculus, and ordinary differential equations.
2. Develop skills in applying mathematical concepts to solve real-world problems through project implementation

Course Outcomes: After learning the course, the students will be able to:
1. Develop programs for matrices, differential calculus, and ordinary differential equations.
2. Develop project using relevant mathematical concepts to address societal issues.

Detailed Syllabus

Expt. No.	List of Experiments using open source software-(16 hrs.)
1	Conversion of matrices into systems of linear equations.
2	Conversion and solution of systems of linear equations into matrix form.
3	Determine linear dependence/independence of vectors and compute eigenvalues and eigenvectors.
4	Evaluation of Indeterminate Forms.
5	Expand functions using Taylor's and Maclaurin's series.
6	Perform successive differentiation of functions.
7	Solve exact and non-exact differential equations.
8	Solve higher-order linear differential equations.
9	Apply differential equation techniques to determine current or charge in electrical circuits.
10	Apply differential equation methods to analyze temperature distribution based on Fourier's Law of heat conduction.

Mini Project* - (14 hrs.)

***Mini Project Guidelines:**

Students must prepare a mini-project based on topics such as matrices, differential calculus, ordinary differential equation, linear differential equation, or other relevant mathematical concepts.

General Guidelines:

1. The project group should consist of not more than 4 students per group.
2. The project report should include mathematical analysis or applications, and, where applicable, software performance parameters.
3. The project output must be submitted in the prescribed standard format.

References:

1. Higher Engineering Mathematics by H. K. Dass, 22nd edition, S. Chand Publication, Delhi.
2. Advanced Engineering Mathematics by S.R.K. Iyengar, Rajendra K. Jain, 4e, Alpha Science International, Ltd.

3. Advanced Engineering Mathematics by Peter V. O'Neil, 7e, Thomson Learning.
4. Advanced Engineering Mathematics by M. D. Greenberg, 2e, Pearson Education.
5. Higher Engineering Mathematics by B. S. Grewal, 43e, Khanna Publication, Delhi

Program:	B. Tech. (E &TC)						Semester: I	
Course:	Engineering Chemistry						Code: BSH31BS08	
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
3	3	-	-	1	20	20	60	100

Prior knowledge of:

1. Structure of water.
2. Volumetric analysis.
3. Fossil and derived fuels.
4. Corrosion and its effects.
5. Electrochemical series.
6. Classification and properties of polymers.
7. Basics of conducting polymers.

Course Objectives: This course aims at enabling students,

1. To introduce students to electronic material with their properties and applications.
2. To lead students to investigate the advancement in engineering materials.
3. To familiarize students with instrumental methods for qualitative and quantitative analysis of water and explore the importance of green chemistry.
4. To build consciousness about the recent development in alternative energy sources and batteries.
5. To make students acquainted with chemical and electrochemical mechanisms of corrosion and corrosion control.

Course Outcomes: After learning the course, the students should be able to:

1. Apply properties of semiconductor materials in electronic devices.
2. Describe the structure, properties and performance of speciality polymers and nanomaterials in technological applications.
3. Analyze water softening techniques and green chemistry principles for environmental sustainability.
4. Use preventive methods of corrosion in real-life problems.
5. Apply fundamentals of fuel combustion and battery technology to assess their energy efficiency.

Detailed Syllabus

Unit	Description	Duration [Hrs]
I	**AI in Engineering Chemistry:** For visualizing molecules, Understanding DFT, ab initio methods, Hardness & alkalinity calculation, Boiler problem analysis, Green solvent identification, Conducting polymer mechanism, Case study analysis of corrosion, GCV/NCV calculations, Battery reactions (Li-ion, fuel cells) Ethical AI usage. Tools: SMILES, InChI, Wolfram Alpha, ChatGPT, Perplexity AI, Excel + AI, ChemDraw, Molview, Gemini, claude. **A) Electronic Material Chemistry:** Classification of materials: conductors, semiconductors, insulators, Band theory basics for electronic materials, Intrinsic & extrinsic semiconductors dopants, defects and their chemistry, Carbon fibre & glass fibre, Dielectric materials: dielectric constant, polarization, breakdown,	10

	Piezoelectric, ferroelectric & pyroelectric materials. Applications in sensors & ICs, Organic semiconductors & OLED materials. **B) Materials for Wearable & Flexible Electronics:** Conductive Polymers: Plastic like PEDOT: PSS that can actually conduct electricity while remaining flexible, Sel Healing Materials: Polymers that can "repair" their own broken circuits using reversible chemical bonds (Ion-Dipole interactions), Hydrogels: Water-based polym networks used as conductive interfaces for biosensors.	
II	**Advanced Engineering Materials and Nanotechnology:** **A] Advanced Engineering Materials :** Conducting Polymers: Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers, Biodegradable Polymers: PHBV, Liquid crystal polymer-Kevlar, E waste management, PCB & packaging relevance **B] Nanomaterials:** Introduction, classification of nanomaterials based on dimensions, structure, properties and applications of graphene and carbon nanotubes, quantum dots (semiconductor nanoparticles), and their applications in sensors, transistors, energy storage, thin film deposition techniques (nanoparticle synthesis), sustainable nanomaterials.	9
III	**Water technology & Green Chemistry:** **A) Water Technology:** Hardness & alkalinity of water with their estimation. Boiler troubles: Boiler corrosion, Sludges, Scales, and Caustic embrittlement. External treatment methods- Softening of water by Zeolite & ion-exchange processes. Desalination of water – Reverse osmosis. **B) Green Chemistry**: 12 principles, Green solvents in PCB & chips cleaning.	9
IV	**Corrosion Science:** Corrosion: introduction, types of corrosion, mechanism of atmospheric corrosion and wet corrosion. Galvanic series. Factors affecting corrosion: nature of metal and nature of environment. Different types of corrosion: Pitting corrosion, concentration cell corrosion, stress corrosion and soil corrosion. Corrosion control: methods of prevention of corrosion - cathodic and anodic protection, metallic coatings and its types - anodic and cathodic coatings. Methods to apply metallic coatings - hot dipping, cladding, electroplating and cementation. Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Corrosion control methods-Cathodic protection – Sacrificial anode and impressed current methods.	8
V	**Energy Sources and Conversion Technologies:** **A) Fuel and combustion**: Calorific value of fuel – GCV, NCV Determination of calorific value – Bomb calorimeter, Boys colorimeter and numerical. Classification- solid fuels: - Coal analysis of coal proximate and ultimate analysis and their significance. Liquid fuels–Petroleum and its refining, Knocking – octane and cetane rating, Gaseous fuels – Hydrogen as future fuel, Alternative fuels: Power alcohol and biodiesel advantages, Combustion: chemical reactions, calculations on air requirement for combustion. **B) Battery Technology**: Electrochemical principles, Li ion, solid state Sodium ion battery, Charging and discharging reaction, fuel cell, battery safety.	9
	Total	**45**

Text Books:

1. Chawla, S. (2015). *A Textbook of Engineering Chemistry*. New Delhi: Dhanpat Rai & Co.

2. Dara, S. S. (2010). *Engineering Chemistry*. New Delhi: S. Chand Publications.
3. Jain, P. C., & Jain, M. (2016). *Engineering Chemistry*. New Delhi: Dhanpat Rai Publishing Co.
4. Jensen, F. (2017). *Introduction to Computational Chemistry* (3rd ed.). John Wiley & Sons.
5. Kulkarni, S. K. (2014). *Nanotechnology: Principles and Practices* (3rd ed.). Springer.
6. Palanna, O. G. (2017). *Engineering Chemistry*. Mc Graw-Hill Education.
7. Dr. Shikha Baskar, (2012). *Engineering Chemistry*. Wiley India Pvt. Ltd.

Reference Books:

1. Ram D. Gupta, Hydrogen as a fuel C. R. C. Publication (2009).
2. V. R. Gowariker, Polymer Science New Age International Publication (2015).
3. T. Gregory, Nanotechnology Springer Verlog New York (1999).
4. Charles P. Poole, Frank Owens, Introduction to Nanotechnology, John Wiley & Sons (2003)
5. Engineering Chemistry by Wiley India Pvt. Ltd, First edition 2011.

E Sources:

1. http://www.digimat.in/nptel/courses/video/113106062/L01.html
2. https://www.coursera.org/learn/plastic-electronics
3. https://www.coursera.org/specializations/sensor-technologies-for-biomedical-applications
4. https://onlinecourses.nptel.ac.in/noc26_ce49/preview

Program:	B. Tech. (E &TC)					Semester: I	
Course:	Engineering Chemistry Laboratory					Code:	BSH31BS09
Credits	Teaching Scheme (Hrs. /Week)			Evaluation Scheme and Marks			
	Theory	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	50	-	-	50

Prior knowledge of:

1. Theory of acids and bases
2. Molarity, normality and molality
3. Titration method
4. Conductivity in polymer

Course Objectives:

1. To help students to procure conceptual clarity of engineering chemistry through laboratory experiments.
2. To develop experimental skills to acquire insight into societal and environmental issues.
3. To develop knowledge for the synthesis of conducting polymer.

Course Outcomes: After completion of this course, the students will be able to,

1. Apply volumetric and instrumental methods for quantitative and qualitative analysis of materials
2. Demonstrate the process of polymer synthesis and corrosion resistance improvement for metals.

Detailed Syllabus

Expt. No.	List of Experiments
1	Determination of total hardness of water sample by EDTA method.
2	Determination of type of alkalinity of given water sample and extent of alkalinity.
3	To determine the dissociation constant of a weak acid (acetic acid) using a pH meter.
4	Titration of mixture of strong acid with strong base using conductivity meter and determine strength of acid.
5	To determine the maximum wavelength of absorption of $KMnO_4$, verify Beer's law and find concentration of the unknown sample.
6	To estimate the amount of Fe (II) present in the given solution potentiometrically.
7	To determine the chloride (Cl^-) content of water sample by Mohr's method (Argentometric method).
8	Proximate analysis of Coal.
9	To perform electroplating of copper for enhancing corrosion resistivity and determination of its electrochemical equivalent (ECE).
10	To prepare the phenol-formaldehyde resin.
11	Synthesis of conducting material polyaniline.

References:

1. J. Mendham, R, C, Denny, J. D. Barnes, M. J. K. Thomas, Vogels Text book of Qualitative Chemical Analysis by 6 e, Pearson Education ltd.
2. O. P. Virmani and A. K. Narula, Applied Chemistry Theory and Practice, 2e, New age International (P) Ltd.

Program:	B. Tech. (E &TC)				Semester: I				
Course:	Fundamentals of Electrical Engineering				Code: BET31ES01				
Credit	Teaching Scheme (Hrs./week)				Evaluation Scheme				
	Lecture	Practical	Tutorial	Other	FA		SA	TW	Total
					FA1	FA2			
4	3	2	-	1	20	20	60	25	125

Prior knowledge of: Fundamentals of Network

Course Objectives: This course aims at enabling the students to

1. Acquire skills to analyze and solve DC and AC electrical circuits using simplification techniques, theorems, and fundamental principles.
2. Understand magnetic circuits, inductance, and the operation of transformers and DC machines for performance evaluation.
3. Acquire foundational knowledge of electrical measurement principles and instrument operations for precise evaluation of DC and AC quantities.

Course Outcomes: After learning the course, the students will be able to:

1. Solve DC electrical circuits using network simplification techniques and network theorems.
2. Analyze magnetic circuits and inductance parameters for engineering applications.
3. Compute electrical quantities in single-phase and three-phase AC circuits using fundamental principles.
4. Evaluate operation and performance of single-phase transformers and DC machines.
5. Apply the theoretical principles governing the operation and performance of electrical measuring instruments for AC and DC measurements.

Detailed Syllabus

Unit No.	Description	Duration (Hrs.)
I	**DC Circuits** Basic circuit elements and sources, Ohm's law, Kirchhoff's laws, Series and parallel connections of circuit elements, Star-delta transformation, Mesh current analysis, Node voltage analysis. Theorems: Thevenin's theorem, maximum power transfer theorem, and superposition theorem. (Only independent sources	9
II	**Magnetic Circuits** Introduction to magnetic circuit terms and definitions, Faraday's laws, Lenz's law , comparison between electric and magnetic circuits, magnetic circuit analysis, series and parallel magnetic circuits, self-inductance, mutual inductance, coefficient of mutual inductance, coefficient of coupling, and dot rule.	9
III	**AC Circuits** Generation of alternating emf and associated terms, phasor representation, Analysis of RL and RC series and parallel circuits, power triangle, power factor, resonance in RLC series, and related numerical Generation of three-phase EMF, star connection, delta connection, relationship between line and phase quantities, and solution to three-phase balanced circuits.	9

IV	**AC and DC Machines** **Single-Phase Transformers** Principle of operation, construction, types of transformers, EMF equation, leakage flux and leakage reactance, operation of transformer under no load and on load, phasor diagrams, equivalent circuit, losses and efficiency, regulation and all-day efficiency, autotransformer, Applications, AI in Transformers **DC Generator:** Principle of operation, construction, EMF equation **DC Motors:** Principle of operation, back EMF, torque equation, condition for maximum power developed. Types of DC motors, various characteristics, methods of speed control, and the necessity of starters. Applications, AI in DC Machines,	9
V	**Electrical Measuring Instruments** DC PMMC instruments, shunts, multipliers, multimeters, moving-iron ammeters and voltmeters, dynamometers, wattmeters, AC watthour meters, extension of instrument ranges, measurement of active and reactive power in a three-phase balanced load by using one wattmeter and two wattmeter methods, and the effect of power factor on wattmeter readings. AI in Measuring Instruments: Standard specifications of single- and three-phase energy meters.	9
	Total	**45**

Text Books:

1. B. L. Theraja, Electrical Technology, Vol. – I & II, S. Chand & Co.
2. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering," Tata McGraw Hill, 4th Edition, 2019.

Reference Books

1. E. Fitzgerald, Electric Machinery, TMH Publications.
2. M. G. Say, Alternating Current Machines, CBS Publishers.
3. Nagrath and Kothari, Electrical Machines, TMH Publications.
4. P. S. Bhimbra, Electrical Machinery, Dhanpatrai Publishers.
5. D. C. Kulshreshtha, “Basic Electrical Engineering," McGraw Hill, 2nd Edition, 2019.
6. E. Hughes, “Electrical and Electronics Technology”, Pearson, 10th Edition, 2010.
7. Vincent Del Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 2nd Edition, 2015
8. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2nd Edition, 2003

E-resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/122106025
3. https://onlinecourses.nptel.ac.in/noc21_ee55/preview

List of Experiments

1.To study and get familiarised with the lab facilities, equipment, standard operating procedures and lab safety
Know your electrical lab
Safety guidelines and procedures for lab work
proper usage of hand tools and a test equipment

Basic DC Electrical Circuit experiments (Any 2)

2.Verification of Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL)
3.Verification of Superposition Theorem
4.Verification of Thevenin's Theorem
5.Verification of Maximum Power Transfer Theorem

Single and three phase AC circuits (Any 3)

6.Measurement of Power in a Single-Phase AC Circuit
7.To verify the relation between phase and line quantities in three phase balanced star and Delta connected load
8.Open Circuit/ Short Circuit Test on Single-Phase Transformer
9. Determination of Efficiency and Regulation of Transformer by Direct loading test.
10.Study of Auto -Transformer
11.To determine the resonance frequency circuit in a series RLC circuit. (Simulation Base)

DC Machines (Any 2)

12.Speed Control of DC Shunt Motor
13.Study of Starter for DC Motor (3-point / 4-point starter)
14.Study of different parts of DC Machine

Power and Energy Measurements (Any 2)

15.Measurement of Power Using the Two Wattmeter Method
16.Measurement of Power Using the One Wattmeter Method
17.Study of Single-Phase Energy Meter
18.Study of Energy Consumption of Electrical Appliances (verification of electricity bill)
19.Case Study on Energy Saving Techniques

Program:	B. Tech. (E &TC)				Semester: I				
Course:	Programming for Problem Solving				Code: BET31ES02				
Credit	Teaching Scheme (Hrs./week)				Evaluation Scheme				
	Lecture	Practical	Tutorial	Other	FA		SA	TW	Total
					FA1	FA2			
3	2	2	-	1	10	10	30	25	75

Prior knowledge of: Basic knowledge of computers and logical thinking.

Course Objectives: This course aims at enabling the students to

1. Make to understand the fundamentals of C programming and structured problem-solving techniques to design and implement solutions.
2. Introduce to problem-solving techniques using arrays, searching, and sorting algorithms.
3. Expose to apply modular programming concepts using functions, recursion, and pointers for solving computational problems.
4. Provide knowledge of structures and file handling for developing simple real-world applications.

Course Outcomes: After learning the course, the students will be able to:

1. Apply conditional statements and loops to solve basic programming problems.
2. Analyze and implement searching, and sorting algorithms, and evaluate their performance.
3. Implement modular programs using functions, recursion, and pointers.
4. Use structures and file handling concepts to build simple applications.

Detailed Syllabus

Unit	Description	Duration (Hrs.)
I	**Introduction to Programming & Problem Solving** **Problem-solving approach:** Algorithms, flowcharts, pseudocode **Basics of C:** Structure of a program, compilation process Data types, variables, constants, operators Input/Output functions Conditional statements (if, switch) Loops (for, while, do-while) **Debugging:** syntax and logical errors ***Enhancement:*** Add simple real-life problems and coding practice.	7
II	**Arrays, Strings & Algorithm Analysis** 1-D and 2-D arrays Strings and character arrays Searching: Linear and Binary Search Sorting: Bubble, Insertion, Selection Introduction to time complexity (basic idea only). *Enhancement:* Implement & Compare sorting algorithms using time/space complexity.	8
III	**Functions, Recursion & Pointers** **Functions:** declaration, definition, types Parameter passing (call by value/reference) **Recursion:** factorial, Fibonacci **Pointers:** basics, pointer arithmetic Relationship between arrays and pointers Introduction to dynamic memory allocation (basic idea) **Enhancement:** Problem-solving using divide-and-conquer approach.	8

IV	**Structures, File Handling & Applications** **structures in C**, Nested structures Introduction to basic data structures (concept only), Array of structures, Pointer to structure, Structures vs Unions, Dynamic memory allocation with structures, File handling: read/write operations Mini-application development (student record, simple database, etc.)	**7**
	Total	**30**

Text Books:

1. E Balgurusamy, "Programming in ANSI C", Tata McGraw-Hill, Eighth Edition, 2019.
2. Yashavant Kanetkar, "Data Structures Through C: Learn the fundamentals of Data Structures through C", BPB Publication, Third Edition, 2019.
3. R.S. Salaria, AICTE"s Prescribed Textbook: "Programming for Problem Solving", Khanna Book Publishing Co.,2022

Reference Books

1. Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Galgotia Books Source, 2nd Edition, 2008. 2. Reema Thareja,
2. "Data Structures using C", Second Edition, Oxford University Press, 2014
3. Herbert Schildt, "C: The Complete Reference", Tata McGraw-Hill, Fourth Edition, 2017.

E-resources: NPTEL Course Name Instructor Host Institute

1. Introduction to Programming in C Prof. Satyadev Nandakumar IITK
   https://onlinecourses.nptel.ac.in/noc25_cs119/preview
2. Problem Solving Through Programming in C Prof. Anupam Basu IIT KGP
   https://onlinecourses.nptel.ac.in/noc26_cs53/preview

List of Experiments

General Guidelines: All Experiments are to be performed.

Experiments from the following list need to be completed using Code Blocks /Turbo C / Online GDB.

1. Formulate algorithms, flowcharts, and pseudocode for solving simple real-life problems.
2. Use basic C constructs such as data types, operators, and input/output functions.
3. Apply decision-making statements like if, if-else, and switch in programs.
4. Apply looping constructs (for, while, do-while) to solve problems such as factorial and series.
5. Perform operations on one-dimensional and two-dimensional arrays.
6. Apply string handling operations in C programming.
7. Implement searching techniques such as Linear Search and Binary Search.
8. Implement sorting techniques such as Bubble Sort.
9. Apply functions and parameter passing techniques (call by value and call by reference).
10. Apply recursion for problems like factorial and Fibonacci series.
11. Demonstrate the use of pointers and structures.
12. Apply C programming concepts to complete a mini-project using arrays, functions, pointers, structures, and file handling

Program:	B. Tech. (E &TC)				Semester:		I	
Course:	Constitution of India				Code:		BSH31VE01	
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	2	-	-	-	25	25	-	50

Course Objectives:

1. To introduce students to the fundamental principles, philosophy, and key features of the Indian Constitution.
2. To familiarize students with the structure and functioning of government and key constitutional provisions.
3. To enable students to apply constitutional values, rights, and duties in understanding contemporary issues and responsible citizenship.

Course Outcomes: After learning the course, the students will be able to,

1. Explain the fundamental principles and key features of the Indian Constitution, including Preamble, Rights, Duties, and DPSP.
2. Describe the structure and functioning of the Executive, Legislature, and Judiciary, including the law-making process.
3. Illustrate constitutional provisions such as amendments, writs, and citizen mechanisms to address rights and governance issues.
4. Apply constitutional values to evaluate contemporary issues and challenges in civic and professional contexts.

Unit	Description	Duration [Hrs]
I	**Foundations of the Indian Constitution** 1. Introduction to the Indian Constitution: brief historical background, making of the Constitution, and its significance 2. The Preamble: ideals, philosophy, and interpretation 3. Salient features of the Indian Constitution: sovereignty, secularism, democracy, federalism, and rule of law 4. Fundamental Rights and Fundamental Duties: concepts and relevance in contemporary society 5. Directive Principles of State Policy (DPSP): objectives and role in governance 6. Relationship between Fundamental Rights, Duties, and DPSP	7
II	**Structure and Functioning of Government** 1. Union Executive: President, Vice-President, Prime Minister, and Council of Ministers—roles and functions 2. Parliament: composition and functioning of Lok Sabha and Rajya Sabha 3. Legislative process: stages of law-making (bill to act) 4. Judiciary: structure, independence, and concept of judicial review 5. Federalism: Centre–State relations and distribution of powers 6. State Government: role of Governor and State Legislature (overview)	8
III		7

	Constitutional Mechanisms and Citizen Interface 1. Amendment process of the Constitution and basic structure doctrine 2. Constitutional bodies: Election Commission of India and Comptroller and Auditor General—roles and functions 3. Emergency provisions: national, state, and financial emergencies 4. Constitutional remedies: writs and judicial remedies for protection of rights 5. Public Interest Litigation (PIL): concept and significance 6. Introduction to citizen-centric mechanisms: Right to Information (RTI)	
IV	**Constitution in Contemporary Context** 1. Judicial activism and its role in safeguarding constitutional values 2. Contemporary constitutional issues: freedom of speech, right to privacy, gender justice, and environmental protection 3. Challenges to constitutional governance: secularism, federalism, and social justice 4. Recent constitutional developments and amendments 5. Basic comparative perspective: Indian Constitution and selected global practices	8
	Total	**30**

Text Books:

1. E 1. Durga Das Basu, ―Introduction to the Constitution of India ―, Prentice Hall of India, New Delhi,24th edition, 2020, ISBN-109388548868
2. Clarendon Press, Subhash C, Kashyap, ― Our Constitution: An Introduction to India‘s Constitution and constitutional Law‖, NBT, 5th edition, 2014, ISBN-9781107034624

Reference Books:

1. Maciver and Page, ―Society: An Introduction Analysis ―, Laxmi Publications, 4th edition, 2007, ISBN 100333916166
2. PM Bhakshi, ―The constitution of India‖, Universal Law Publishing - An imprint of Lexis Nexis, 14th edition, 2017, ISBN-108131262375
3. Indian Constitution by Subhash C. Kashyap, National Book Trust, New Delhi.
4. Constitution of India and Professional Ethics, Dr. G. B. Reddy & Mohd. Suhaib, Dreamtech Press.

e-sources:

1. https://www.legislative.gov.in/constitution-of-india
2. **https://legalaffairs.nalsar.ac.in/**

Program:	B. Tech. (E &TC)						Semester: I	
Course:	Indian Knowledge System (IKS)						Code:	BSH31IK01
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	2	-	-	-	25	25	-	50

Prior knowledge: NIL

Course Objectives: This course aims at enabling students,

1. To familiarize with the concepts of Indian Knowledge System
2. To get acquainted with the applications of Indian Knowledge System

Course Outcomes: After learning the course, the students should be able to:

1. Explain the historical evolution, institutional frameworks, and modes of transmission of the Indian Knowledge System.
2. Describe key scientific and technological contributions of ancient India.
3. Apply ethical and leadership insights from Indian literary and art traditions.
4. Use traditional ecological knowledge to promote sustainable practices.

Detailed Syllabus

Unit		Duration [Hrs]
I	**Unit 1: History and Development of the Indian Knowledge System** 1. Origins and Evolution: Vedic, Post-Vedic, Classical, and Medieval contributions to IKS 2. Introduction to Vedas and Shad Darshanas as foundational sources of Indian philosophy, 3. Transmission of Knowledge: Oral tradition, Shruti-Smriti, Guru Shishya Parampara, and Early Texts 4. Institutional Framework: Ancient Indian universities (Takshashila, Nalanda, Vikramshila, Vallabhi) 5. Revival: Modern relevance and efforts towards restoration	7
II	**Unit 2: Scientific and Technological Contributions of IKS** 1. Contributions to Mathematics (Baudhayana, Aryabhata, Brahmagupta, and Bhaskaracharya II) 2. Astronomy and Cosmology (Surya Siddhanta, Jyotish Shastra, Astronomical Observatories) 3. Metallurgy, Material Science, and Engineering (Iron Pillar, Wootz Steel, Zinc Distillation) 4. Civil Engineering and Architecture (Vastu Shastra, Water Management Systems, Temple and City Planning) 5. Yoga, Ayurveda and Traditional Healthcare Systems	8

III	**Unit 3: Literary, Performing and Artistic Traditions and festivals of India** 1. Contributions of Indian Literature to Ethics and Leadership (Ramayana, Mahabharata, Panchatantra & Nitishastra) 2. Folk Traditions and Oral Narratives: Preserving local culture and wisdom 3. Performing Arts and Knowledge Expression (Natya Shastra, Temple Art, Music and Dance Forms) 4. Indian festivals as vibrant expressions of cultural values, community bonding, and sustainable environmental practices	7
IV	**Unit 4: Indigenous Technologies, Sustainability, and Ecology in IKS** 1. Environmental Ethics and Sustainability Practices in Ancient India 2. Techniques for Conserving Water (Stepwells, Temple Tanks, and Dams) 3. Agricultural Knowledge Systems (Crop Rotation, Indigenous Seeds, Zero Budget Natural Farming) 4. Indigenous Knowledge in Disaster Management and Climate Adaptation 5. Insights from IKS for Contemporary Sustainable Development	8
	Total	**30**

Textbooks:

1. Mahadevan, B., Bhat, Vinayak Rajat, Nagendra Pavanan R.N. (2022), "Introduction to Indian Knowledge System: Concepts and Applications", PHI Learning Private Ltd., Delhi.
2. Dharampal (2021), "Indian Science and Technology in the Eighteenth Century", ISBN10:8175310936.

Reference Books:

1. Kapil Kapoor, Avadhesh Kumar Singh.(2005), "Indian Knowledge Systems" (Vol. 1 and Vol.2), ISBN-10:9788124603369.

E-sources:

1.https://onlinecourses.swayam2.ac.in/ntr24_ed78/preview
2. https://onlinecourses.swayam2.ac.in/imb24_mg20/preview
3. https://iksindia.org/

Program:	B. Tech. (E & TC)					Semester: I	
Course:	Communicative English					Code:	BSH31AE01
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	30	20	-	50

Prior knowledge of: Basic English communication

Course Objectives: This course aims at enabling students to:
1. Strengthen language skills through grammar, vocabulary, and comprehension activities.
2. Enhance students' ability to communicate ideas clearly in written and spoken forms.

Course Outcomes: After learning the course, the students will be able to:
1. Interpret key ideas from listening and reading tasks to demonstrate comprehension.
2. Develop structured paragraphs and formal emails using grammar, vocabulary and writing techniques.
3. Organize information into a logical presentation framework to highlight clear and structured oral presentations.

Detailed Syllabus

Expt. No	Suggested List of Experiments	Duration (Hrs)
1	**Apply Listening for Understanding:** Practice listening through IELTS & TOEFL-style audio clips and respond to comprehension-based questions with accuracy.	2
2	**Apply Listening for Understanding:** Practice listening through audio clips of interviews and podcasts and respond to comprehension-based questions with accuracy.	2
3	**Interpret Text through Guided Oral Reading:** Read and interpret short story text, *The Necklace* by Guy De Maupassant with appropriate pronunciation, pauses, and intonation, and answer questions to demonstrate comprehension.	2
4	**Apply Analytical Reading Comprehension Techniques:** Apply skimming and scanning techniques to understand and interpret unseen passages effectively, for competitive exams.	2

5	**Engage in Integrated Comprehension Practice:** Listen to audio content and follow the text of Steve Jobs' speech 'Stay Hungry, Stay Foolish' and respond to comprehension questions demonstrating understanding.	**2**
6	**Use Grammar in Context:** Use appropriate grammar structures in contextual sentence-building and short communication tasks; Identify and Correct Common Errors.	**2**
7	**Use Functional and Business Vocabulary:** Refine Sentence Structures by using appropriate tense, agreement, and sentence patterns to enhance clarity and correctness. Use functional and basic business vocabulary accurately in speaking and writing tasks.	**2**
8	**Practice Note-Taking and Paragraph Writing Skills:** Apply note-making techniques to organize ideas and write clear, structured paragraphs. Refine writing style and perform grammar checks with the help of Generative AI tools.	**2**
9	**Apply Email Etiquette and Review Professional Emails:** Apply advanced email etiquette by editing and refining emails for clarity, tone, correctness, and professionalism, including peer review and identification of common errors in workplace communication.	**2**
10	**Draft Professional Emails for Workplace Communication:** Draft clear and formal emails for internships, job applications, and follow-ups, focusing on appropriate subject lines, structure, tone, and basic professional etiquette.	**2**
11	**Construct Visually Engaging PowerPoint Presentations.** Convey ideas concisely in order to create professional decks that support rather than distract from their message.	**2**
12	**Deliver Persuasive Oral Presentations:** Practice techniques for maintaining eye contact, vocal variety, managing stage presence and articulating complex ideas clearly to ensure maximum audience engagement and retention.	**2**
13	**Group Discussion Techniques:** Examine mock group discussions to see how different roles and structures impact the conversation.	**2**

14	**Express yourself in Group Discussions:** Participate in group discussions on technical and general topics, demonstrating clarity, teamwork and communication skills.	**2**
15	**Deliver a Public Speech:** Apply voice modulation, paralanguage, and clarity in structured speaking tasks.	**2**
	Total	**30**

Text Books:

1. Essential English Grammar, **4th Edition (2015)** – Raymond Murphy, **Cambridge University Press**
2. Kee, R. (2022, March 5). "Stay Hungry, Stay Foolish": Steve Jobs 2005 Stanford Commencement Speech (Transcript & Audio) — Roxine Kee. Roxine Kee. https://www.roxinekee.com/blog/stay-hungry-stay-foolish
3. De Maupassant, G. & http://www.HorrorMasters.com. (n.d.). The Necklace. https://susannahfullerton.com.au/wp-content/uploads/2019/04/The-Necklace.pdf
4. Developing Communication Skills, Revised Edition (2017) – Krishna Mohan & Meera Banerji, Macmillan Education India

Reference Books:

1. Practical English Usage, 4th Edition (2019) – Michael Swan, Oxford University Press
2. Oxford Guide to English Grammar, Latest Edition – John Eastwood, Oxford University Press
3. Better English Pronunciation, 2nd Edition – J.D. O'Connor, Cambridge University Press

E Resources

1. British Council – LearnEnglish (Grammar, Listening, Speaking) https://learnenglish.britishcouncil.org
2. Cambridge Dictionary & Grammar https://dictionary.cambridge.org

Program:	B. Tech. (E & TC)					Semester: I	
Course:	Life Skills 1					Code:	BSH31CC01
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	50	-	-	50

Prior knowledge of: Nil

Course Objectives: This course aims at enabling students to:

1. To help students understand self-awareness, well-being and emotional regulation for personal growth.
2. To enable students to practice critical thinking, problem-solving and goal-setting skills for academic and life success.

Course Outcomes: After learning the course, the students will be able to:

1. Identify personal strengths, lifestyle habits and well-being practices using self-assessment and reflective activities.
2. Use emotional intelligence strategies in dynamic social and academic contexts.
3. Apply cognitive thinking and problem-solving strategies to set SMART goals for personal and professional life.

Detailed Syllabus

Expt. No	Suggested List of Experiments	Duration (Hrs)
1.	Developing Self Awareness: Explore personal interests, beliefs, strengths and goals through reflective activities, self-assessment exercises, and group discussions to develop self-understanding.	2
2	Explore Therapeutic Hobbies: Explore creative (art, music, writing) and physical (sports, dance, yoga) hobbies through short activity sessions and reflect on which activities help reduce stress and improve mental clarity.	2
3	Evaluate Holistic Health Habits: Evaluate personal eating patterns and physical activity levels through a lifestyle tracking exercise and design a simple daily routine for healthier living.	2
4	Develop a Personal Well-being Plan: Design a short project outlining a personal well-being strategy that includes hobbies, emotional regulation practices and healthy lifestyle habits.	2

5	Analyze Personal Potential (SWOT Analysis): Analyze personal strengths, weaknesses, opportunities, and threats through a guided SWOT worksheet and group discussion to identify hidden talents and areas for self-improvement.	2
6	Identify Emotional Triggers: Identify situations that cause overthinking, stress, or anxiety by analysing common academic scenarios and discussing emotional responses in small groups.	2
7	Examine Relationship Dynamics: Examine empathy, personal boundaries and attachment styles through role-play activities and reflective discussions on relationship patterns.	2
8	Develop Assertiveness Skills: Develop assertive communication strategies through scenario-based role plays to practice expressing opinions while respecting others.	2
9	Develop Resilience to Peer Pressure: Develop resilience strategies to resist negative peer pressure or addictive behaviours through simulation exercises and discussion of real-life situations.	2
10	Reflect on Personal Learning Journey: Reflect on insights gained from the life skills activities through guided journaling and group sharing to evaluate personal growth.	2
11	Apply Growth Mindset Principles: Apply growth mindset concepts by reflecting on a past failure and reframing it as a learning opportunity through guided journaling and peer discussion.	2
12	Demonstrate Thinking Patterns: Demonstrate convergent and divergent thinking by brainstorming multiple solutions to a simple engineering or real-life problem and analysing the thinking approach used.	2
13	Apply Problem-Solving Frameworks: Apply logical reasoning frameworks to solve case-based academic or ethical problems through structured group problem-solving activities.	2
14	Design SMART Goals: Design personal academic or career goals using the SMART framework and present an action plan to achieve them.	2
15	Present Life Skills Application Project: Present a small group project demonstrating how life skills concepts can be applied to improve personal or academic life.	2
	Total	**30**

Reference Books:

1. The 7 Habits of Highly Effective Teens" by Sean Covey Publisher: Simon & Schuster, 2017
2. How to Win Friends and Influence People" by Dale Carnegie Publisher: Simon & Schuster. 2020
3. Emotional Intelligence: Why It Can Matter More Than IQ" by Daniel Goleman Publisher: Bantam Books, 2021.
4. Mindset: The New Psychology of Success" by Carol S. Dweck Publisher: Ballantine Books, 2019.
5. The Power of Habit: Why We Do What We Do in Life and Business" by Charles Duhigg Publisher: Random House, 2016

E Sources -

1. Psychology Today (www.psychologytoday.com): Psychology Today publishes articles and insights from psychologists and mental health experts that can be useful for improving life skills and emotional intelligence.
2. Lifehack (www.lifehack.org): Lifehack shares practical tips, techniques, and advice on personal development, productivity, and life skills improvement.
3. Coursera (www.coursera.org): Coursera offers online courses on various life skills topics, often provided by universities and experts, to help individuals develop essential skills

Curriculum

Semester II

Program:	B. Tech. (E &TC)						Semester: II	
Course:	Multivariate Calculus						Code:	BSH32BS12
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	CIE		SA	Total
					FA1	FA2		
2	2	-	-	1	10	10	30	50

Prior knowledge of:
1. Elementary Mathematics,
2. Elementary Calculus **is essential.**

Course Objectives: This course aims at enabling students,
1. To strengthen the concepts of multivariable calculus and its application in maxima & minima, error & approximation area, volume
2. To make students acquainted with advanced techniques to evaluate integrals

Course Outcomes: After learning the course, the students should be able to:
1. Find composite function's Derivatives, value of Euler's expression, Jacobians, errors and extrema using Partial Differentiation.
2. Represent the Fourier series for continuous functions and discrete periodic time domain functions in signal form.
3. Compute definite improper integrals using Gamma, Beta function and differentiation under the integral sign.
4. Evaluate multiple integral, Area and Volume for curves and Surfaces using the concept of integration techniques.

Unit	Description	Duration [Hrs]
I	**Partial Differentiation and its applications:** Partial derivatives, Composite function, Chain Rule, variable to be treated as constant, total derivatives. Euler's theorem for homogeneous functions. Jacobian for explicit function, Errors and Approximations, Maxima and Minima of two variable functions.	8
II	**Fourier Series:** Definition, Dirichlet's conditions, full range Fourier series, Harmonic analysis, and engineering applications.	7
III	**Integral Calculus:** Gamma function and Beta function, Differentiation Under the Integral Sign (DUIS).	7
IV	**Multiple Integral and its applications:** Double integration, conversion into polar form, Triple integration, Dirichlet's theorem, applications of double & triple integration to find area and volume.	8
	Total	30

Text Books:
1. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill)
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.)

Reference Books:
1. Higher Engineering Mathematics, 22e, by H. K. Das (S. Chand Publication, Delhi).
2. Advanced Engineering Mathematics, 4e, by S.R.K. Iyengar, Rajendra K. Jain (Alpha Science International, Ltd)
3. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning)
4. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education)
5. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi)

e-sources:

1. NPTEL Multivariable Calculus courseshttps://nptel.ac.in/courses/111107108
2. NPTEL Video for Fourier series http://nptel.iitm.ac.in

Program:	B. Tech. (E&TC)				Semester: II		
Course:	Multivariate Calculus Laboratory				Code:	BSH32BS13	
Credits	Teaching Scheme (Hrs. /Week)			Evaluation Scheme and Marks			
	Theory	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	50	-	-	50

Prior knowledge:
1. Elementary Algebra.
2. Elementary Calculus
3. Basics of Open Source

Course Objectives: This course aims to enable students,
1. To equip with the ability to apply open source software for solving engineering problems involving partial differentiation, integral calculus, multiple integrals, and Fourier series.
2. To develop skills in applying mathematical concepts to solve real-world problems through project implementation.

Course Outcomes: After learning the course, the students will be able to:
1. Develop programs for partial differentiation, integral calculus, multiple integrals, and Fourier series using open source software.
2. Develop project using relevant mathematical concepts to address societal issues.

Detailed Syllabus

Expt. No.	List of Experiments using open-source software-(16 hrs.)
1	Computation of Higher order Partial Derivatives
2	Evaluation of Maxima and Minima for two variable function
3	Computation of the Jacobian for Functions of Several Variables
4	Representation of a periodic function as a Fourier Series
5	Representation of the Fourier Series through Harmonic Analysis for the given Data
6	Evaluation of Gamma & Beta function
7	Evaluation of Integrals using Differentiation Under the Integral Sign (DUIS)
8	Evaluation of Double and Triple Integrals
9	Determine the Area of a Region using Double Integrals
10	Determine the Volume of a Solid using Triple Integrals

Mini Project* - (14 hrs.)

***Mini Project Guidelines:**

Students must prepare a mini-project based on topics such as partial differentiation, Fourier series, integral calculus, multiple integrals or other relevant mathematical concepts.

General Guidelines:

1. The project group should consist of not more than 4 students per group.
2. The project report should include mathematical analysis or applications, and, where applicable, software performance parameters.
3. The project output must be submitted in the prescribed standard format.

References:

1. Higher Engineering Mathematics by H. K. Dass, 22nd edition, S. Chand Publication, Delhi.

2. Advanced Engineering Mathematics by S.R.K. Iyengar, Rajendra K. Jain, 4e, Alpha Science International, Ltd.
3. Advanced Engineering Mathematics by Peter V. O'Neil, 7e, Thomson Learning.
4. Advanced Engineering Mathematics by M. D. Greenberg, 2e, Pearson Education.
5. Higher Engineering Mathematics by B. S. Grewal, 43e, Khanna Publication, Delhi

Program:	B. Tech. (E&TC)						Semester: II	
Course:	Engineering Physics						Code:	BSH32BS03
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Self-Learning	FA		SA	Total
					FA1	FA2		
3	3	-	-	1	20	20	60	100

Prior knowledge of:

1. Atoms, molecules and nuclei.
2. Current, electricity and magnetism.
3. Electromagnetic induction.

Course Objectives: This course aims at enabling students,

1. Build a strong conceptual understanding of, Semiconductor Physics, and Quantum Physics.
2. Introduce recent advances in Physics, including Nanotechnology, Superconductivity and Lasers, Quantum computing
3. Create awareness of the role of Physics principles in various engineering applications.

Course Outcomes: After learning the course, the students should be able to:

1. Illustrate electrical behavior of solids using band theory and charge carriers
2. Apply laser and optical fibre principles to their working and engineering applications
3. Analyse quantum behaviour of particles using wave–particle duality and the Schrödinger equation
4. Use principles of quantum computing to represent quantum states and basic operations
5. Apply concepts of magnetism and superconductivity to magnetic behaviour, phase transitions, and superconducting phenomena with their applications
6. Describe the properties, synthesis methods, and applications of nanomaterials in modern technologies.

Detailed Syllabus

Unit	Description	Duration [Hrs.]
I	**Semiconductor Physics** Formation of bands in solids, electrical conductivity of conductors (qualitative) and semiconductors (intrinsic and extrinsic with derivation), Hall effect (with derivation) and its applications, Fermi level in metal and semiconductors, Fermi Dirac probability distribution function (at T=0K and T>0K), position of Fermi level (intrinsic and extrinsic), variation of Fermi level with temperature and doping concentration, working of PN junction diode on the basis of energy band diagram, solar cell (principle, working, IV characteristics)	8
II	**Laser & Fiber Optics** Laser: Introduction, interaction of light with matter- absorption, spontaneous emission, stimulated emission, population inversion, metastable state, active system, resonant cavity, characteristics of laser, semiconductor hetero-junction laser, carbon dioxide laser, applications of laser-industrial, defense & medical; introduction to holography Fiber Optics: Propagation of light in optical fibers, acceptance angle, numerical aperture, modes of propagation, types of fibers- step index, graded index, single mode & multi-mode, losses- attenuation, dispersion, application of optical fiber in communication system	7
III	**Quantum Mechanics**	8

	Wave particle duality of radiation and matter, de Broglie hypothesis, de Broglie wavelength in terms of kinetic energy, concept of wave packet, phase and group velocity (definition), properties of matter waves, Heisenberg's uncertainty principle, wave function and it's physical significance, normalization condition, well behaved wave function, Schrödinger's time independent wave equation, applications of independent wave equation to the problem of (i) particle in rigid box, (derivation for energy and wave function), (ii) particle in non-rigid box (qualitative). tunneling effect	
IV	**Quantum Computing** Mathematical tools for Quantum computing (complex numbers, Dirac notations, linear algebra, matrix, and probability), inner product, outer product, orthogonality and orthonormality classical bits, qubits- physical realization of superconducting qubits and other architectures, classical gates, Bloch sphere representation of states, quantum computation: single qubit gates, multiple qubit gates, superposition, entanglement, no cloning theorem, bell states and creating bell states, quantum interference, quantum teleportation	7
V	**Magnetism and Superconductivity** Magnetism: Classification of magnetic materials, temperature dependent magnetic transitions (Curie and Neel temperature), magnetic hysteresis loop, magnetic hysteresis loop, giant magneto-resistance (GMR), magneto caloric effect (only statement), adiabatic demagnetization. Superconductivity: Introduction, critical temperature, properties of superconductors (zero electrical resistance, persistent current, Meissner effect, critical magnetic field, isotope effect), BCS theory, type I and II superconductors, low Tc and high Tc superconductors, Josephson effect, DC-SQUID-construction, working and applications, applications - superconducting magnets, maglev trains	8
VI	**Introduction to Nanoscience** Introduction, surface to volume ratio, quantum confinement, properties of nanomaterials- optical, electrical, mechanical, magnetic; methods of preparation of nanomaterials- bottom-up and top-down approaches, physical methods- high energy ball milling, physical vapor deposition; chemical method - colloidal route for synthesis of gold nanoparticle, applications of nanomaterials in medical, energy, automobile, space, defense; sensors, nanoparticles as optoelectronic devices	7
	Total	**45**

Text Book

1. A Textbook of Engineering Physics – M.N. Avadhanulu& P.G. Kshirsagar S. Chand Publication
2. Optics and Photonics – R. Murugeshan, S. Chand Publication
3. Concepts of Modern Physics – Arthur Beiser, McGraw-Hill (Indian Edition)
4. Nanotechnology: Principles and Practices – Sulabha K. Kulkarni, Springer

Reference Book

1. Laser Fundamentals – William Silfvast, Cambridge University Press (India edition)
2. Optical Fiber Communications – Gerd Keiser, McGraw-Hill India
3. Introduction to Quantum Mechanics – David J. Griffiths, Pearson India
4. Fundamentals of Physics- Resnick & Halliday (John Wiley &sons)
5. Quantum Mechanics – G. Aruldhas, PHI Learning
6. Nanoscience and Nanotechnology – M.S. Ramachandra Rao, Wiley India

Program:	B. Tech. (E&TC)					Semester:		II
Course:	Engineering Physics Laboratory					Code:		BSH32BS04
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	TW	OR	PR	Total
1	-	2	-	-	50	-	-	50

Prior Knowledge of

1. Basic concepts of optics (reflection, refraction, interference, diffraction).
2. Fundamentals of semiconductor physics (band gap, carriers, conductivity).
3. Basic electricity and magnetism (current, voltage, magnetic fields).
4. Fundamental knowledge of mechanics and sound waves

Course Objectives: This course aims to,

1. Enable students to apply and analyse principles of optics, acoustics, semiconductor, and magnetism through systematic experimentation and measurement.
2. Develop the ability to analyse and interpret experimental data to draw valid conclusions.

Course Outcomes:

1. Analyse optical and acoustic parameters of materials using experimental methods
2. Interpret electrical properties of semiconductors and the magnetic susceptibility of a paramagnetic solution using experimental methods

Expt. No.	Detailed List of Experiment [Any 10]
1	Newton's Rings (To determine the radius of curvature of Plano-convex lens)
2	Diffraction Grating (To determine the wavelength of different colours)
3	Double Refraction: Birefringence (To determine refractive indices and type of crystal)
4	LASER (To determine the grating element using LASER)
5	Malus Law (To verify the Malus Law of polarization of light)
6	Ultrasonic Interferometer (To determine the compressibility of given liquid)
7	Solar Cell (To determine Fill Factor using IV characteristics)
8	Energy Band Gap (To determine band gap of given semiconductor)
9	Four Probe Method (To determine the energy band gap & resistivity of a given sample)
10	Hall effect (To determine the Hall coefficient, mobility and charge carrier in a given semiconductor)
11	Quincke's method (To determine the magnetic susceptibility of $MnSO_4$ solution)
12	Sound Absorption Coefficient (To determine the sound absorption coefficient of the given materials)
13	Optic Fibre Cable (To determine the numerical aperture and acceptance angle)

Reference Books:

1. Lasers & nonlinear Optics-B. B. Laud-Third edition, New Age International (P)Ltd. Publishers.
2. Fundamentals of Optics- Francis A. Jenkins, Harvey E. White, Fourth edition, McGraw Hill Education Pvt. Ltd.
3. Experiments in Engineering Physics – M.N. Avadhanulu, A.A. Dani, P.M. Pokley,S Chand Publisher.
4. Introduction to solid states Physics - Charles Kittel, Eighth Edition, Wiley India Pvt Ltd.
5. Engineering Physics Laboratory Manual – Jayaraman,Pearson Education Publisher

Program:	B. Tech. (E &TC)						Semester: II		
Course:	Electronic Devices						Code :BET32ES01		
Credit	Teaching Scheme (Hrs./week)				Evaluation Scheme				
	Lecture	Practical	Tutorial	Other	FA		SA	TW	Total
					FA1	FA2			
3	2	2	-	1	10	10	30	25	75

Prior knowledge of the basics of Physics & Mathematics **is essential.**

Course Objectives: This course aims at enabling the students to

1. Provide students with a strong foundation in the concepts, structure, and operation of semiconductor devices such as P–N junction diodes, BJTs, FETs, and MOSFETs.
2. Enable students to analyze the electrical characteristics, switching behavior, and performance parameters of semiconductor devices.
3. Develop students' ability to apply device knowledge in the design and analysis of basic electronic circuits including amplifiers, switches, and regulators.
4. Introduce students to CMOS technology, scaling challenges, and emerging semiconductor devices relevant to modern VLSI applications.

Course Outcomes: After learning the course, the students will be able to:

1. Explain the construction, operation, and characteristics of semiconductor devices including diodes, BJTs, and FETs.
2. Analyze device behavior under different operating conditions including capacitance effects, switching characteristics, and breakdown mechanisms.
3. Apply semiconductor device concepts to analyze and design basic electronic circuits such as amplifiers and switching circuits.
4. Evaluate CMOS technology, power dissipation, scaling challenges, and emerging semiconductor devices for VLSI applications.

Detailed Syllabus

Unit No.	Description	Duration (Hrs.)
I	**P-N Junction Diode:** Formation of P–N junction, Depletion region and barrier potential, V–I characteristics (forward & reverse bias), Diode current components, Temperature dependence, Static and dynamic resistance, Transition and diffusion capacitance, Switching characteristics and reverse recovery time, Breakdown mechanisms (Zener & Avalanche) **Special Diodes:** Zener diode, Tunnel diode, Photodiode, LED	8
II	**Bipolar Junction Transistor (BJT):** Construction and operation of BJT (NPN & PNP), Current components and relationships, Configurations: CB, CE, CC, Input–output characteristics, Operating regions: Cutoff, Active, Saturation, Current gains (α, β), Transistor as an Inverter, amplifier, Ratings and limitations, thermal stability.	8
III	**Field Effect Transistors (FET & MOSFET):** JFET: construction, working, pinch-off voltage, FET parameters (gm, rd), MOSFET: enhancement & depletion type, Threshold voltage, MOSFET I–V characteristics, Biasing techniques, MOSFET amplifiers (CS, CD), BiCMOS Technology.	7

IV	**CMOS Technology and Emerging Semiconductor Devices:** MOS capacitor fundamentals, CMOS inverter operation, voltage transfer characteristics, CMOS logic basics, static and dynamic power dissipation, switching characteristics and propagation delay, MOSFET scaling principles, short channel effects, MOSFET limitations, FinFET structure and operation, SOI devices, overview of modern VLSI and nanoelectronic applications.	7
	Total	**30**

Text Books:

1. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory" 11th Edition, Pearson Education, 2013
2. Thomas L. Floyd, "Electronic Devices", 10th Edition, Pearson Education, 2017
3. Adel S. Sedra, Kenneth C. Smith, Microelectronic Circuits" 7th Edition, Oxford University Press, 2014

Reference Books

1. Ben G. Streetman, Sanjay Banerjee, "Solid State Electronic Devices" 7th Edition, Pearson Education, 2015
2. Donald A. Neamen, "Semiconductor Physics and Devices" 4th Edition, McGraw Hill Education, 2012
3. Behzad Razavi, "Fundamentals of Microelectronics" 2nd Edition, Wiley, 2014
4. S. M. Sze, Kwok K. Ng, "Physics of Semiconductor Devices" 3rd Edition, Wiley-Interscience, 2007
5. R. Jacob Baker, "CMOS: Circuit Design, Layout, and Simulation" 4th Edition, Wiley-IEEE Press, 2019
6. Yuan Taur, Tak H. Ning, **"**Fundamentals of Modern VLSI Devices" 3rd Edition, Cambridge University Press, 2021

E-resources:

1. **NPTEL Course: Introduction to Semiconductor Devices**
   Instructor: Prof. Naresh Kumar Emani,IIT Hyderabad
   Platform: NPTEL
   Link:https://nptel.ac.in/courses/108106181
2. **NPTEL Course: Electronic Devices & Circuits**
   Instructor: Dr. Malaya Kumar Nath, NIT Puducherry
   Link: https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr26_ed101
3. **NPTEL Course: Semiconductor Devices for Next Generation Field Effect Transistors (More than Moore): A Physics Perspective**
   Instructor: By Prof. Sudeb Dasgupta, IIT Roorkee
   Link: https://onlinecourses.nptel.ac.in/noc26_ee86/preview

List of Experiments (Any 8)

1. PN junction diode V–I characteristics
2. Zener diode characteristics
3. LED and Photodiode Characteristics
4. BJT characteristics (CE configuration)
5. BJT switching characteristics
6. BJT Biasing Circuit
7. JFET characteristics
8. MOSFET characteristics
9. MOSFET CS amplifier and its frequency response
10. CMOS inverter characteristics
11. MOS Capacitor C–V Characteristics
12. Simulation Study of FinFET Structure and Characteristics

Program:	B. Tech. (E &TC)						Semester: II	
Course:	Python Programming						Code: BET32ES02	
Credit	Teaching Scheme (Hrs./week)				Evaluation Scheme			
	Lecture	Practical	Tutorial	Other	FA		TW	Total
					FA1	FA2		
2	1	2	-		10	10	30	50

Prior knowledge of –basic mathematical aptitude (arithmetic, algebra, and basic logic) and familiarity with the concept of algorithms and flowcharts

Course Objectives: This course aims at enabling the students to

1. Be acquainted with the fundamental concepts of Python programming, including data types, operators, and input/output operations.
2. Understand control structures and their role in logical problem solving.
3. Gain knowledge of data structures and functions for organizing and structuring programs.
4. Be familiar with file handling concepts and the use of standard Python libraries for basic applications.

Course Outcomes: After learning the course, the students will be able to:

1. Understand fundamental Python programming concepts, including data types, variables, operators, and input/output, to develop simple programs and debug errors.
2. Apply control structures and basic data structures (strings, lists, tuples, and dictionaries) to solve computational problems using logical and algorithmic approaches.
3. Analyze modular programs using functions (including recursion) and basic object-oriented concepts for structured problem solving.
4. Apply file handling techniques and standard Python libraries to process data and develop simple real-world applications.

Detailed Syllabus

Unit No.	Description	Duration (Hrs.)
I	**Introduction to Python, Control Structures and Data Structures:** Basics of Python programming; variables, assignments, dynamic typing; data types; mutable and immutable data types; arithmetic operators and expressions; type conversion; input/output operations; comments and code readability; Syntax and runtime errors. **Control Structures:** Boolean logic and logical operators; conditional statements; loops; use of `range()`; loop control statements; **Basic Data Structures:** Strings; Lists; Tuples; Dictionaries.	7
II	**Functions and Introduction to OOP, File Handling, Libraries** **Functions and program design:** function definition and calling; arguments; formal vs actual parameters; return values; recursive functions. **Introduction to OOP:** basics of classes and objects; attributes and methods; constructor (`__init__`). **File handling:** file operations (open, close); reading and writing text files; handling numerical data in files; CSV/tab-separated file handling; basic file-based data processing. Working with directories and file paths.,Basic introduction to data handling libraries (NumPy concept).	8

Total	**15**

Text Books:

1. Reema Thareja, “Python Programming Using Problem Solving Approach”, Second edition, Oxford University Press, 2019.
2. Ashok N. Kamthane and Amit Ashok Kamthane, “Programming and Problem Solving with Python”, Second edition, McGraw Hill Education (India) Pvt. Ltd., 2022.
3. Jeeva Jose and P. Sojan Lal, “Introduction to Computing and Problem Solving with Python”, Khanna Book Publication, 2019.

Reference Books

1. R. Nageswara Rao, “Core Python Programming”, Third edition, Dreamtech Press, 2022.
2. Paul Barry, “Head First Python: A Brain-Friendly Guide”, Second edition, Shroff Publishers, 2019.
3. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, Third edition, Shroff Publishers, 2025

E-resources:

1. NPTEL — Programming in Python (IIT Madras):https://nptel.ac.in/courses/106106145 — Free, government-certified course by IIT Madras faculty, directly aligned with Indian engineering syllabi, includes assignments and a certificate exam.
2. MIT OpenCourseWare — Introduction to CS using Python:https://ocw.mit.edu/courses/6-0001-introduction-to-computer-science-and-programming-in-python-fall-2016 — Lecture notes, problem sets, and exams from MIT's own first-year course, free of charge.
3. Coursera — Python for Everybody (University of Michigan):https://www.coursera.org/specializations/python — Beginner-friendly, audit for free, covers Units 1–5 topics in a structured week-by-week format with graded assignments.

List of Experiments

1. Perform arithmetic operations and formatted input/output using sequential constructs.
2. Identify, analyze, and correct syntax and runtime errors in Python programs.
3. Develop solutions using selection constructs (if-else, elif) for decision-making problems.
4. Apply iterative constructs (for, while) to solve problems such as factorial and Fibonacci series.
5. Implement nested loops to generate numbers and star patterns.
6. Perform string manipulation operations including indexing, slicing, and number system conversions.
7. Create and manipulate lists, tuples, and dictionaries for data handling.
8. Apply functions (including recursion) for modular problem solving.
9. Perform file input/output operations including reading, writing, and appending data.
10. Process structured data from CSV or tab-separated files.
11. Utilize OS, SYS, and standard libraries (math, random) for basic applications.
12. Mini Project – Python-Based Application Development.

Program:	B. Tech. (E &TC)						Semester: II	
Course:	Sensors and Transducers						Code: BET32PC01	
Credit	Teaching Scheme (Hrs./week)				Evaluation Scheme			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	2	-	-	1	10	10	30	50

Prior knowledge of Fundamentals of Electrical Engineering

Course Objectives: This course aims at enabling the students to

1. To introduce fundamental concepts of sensors, transducers, and measurement systems.
2. To develop understanding of working principles of various electrical and electronic sensors.
3. To enable students to analyze sensor characteristics and select appropriate sensors for applications.
4. To expose students to modern sensors, smart sensing technologies, and real-world engineering applications.

Course Outcomes: After learning the course, the students will be able to:

1. Explain basic concepts, classification, and characteristics of sensors and transducers.
2. Analyze working principles of electrical and electronic sensors used in engineering systems.
3. Comprehend the measurement errors, calibration techniques, and Sources of Noise
4. Apply knowledge of modern sensors and smart sensing systems in real-world scenarios.

Detailed Syllabus

Unit No.	Description	Duration (Hrs.)
I	**Fundamentals of Sensors and Transducers** Definition and classification of sensors and transducers, Primary and secondary transducers, Analog and digital sensors, Active and passive sensors, Static characteristics: accuracy, precision, sensitivity, linearity, hysteresis, Dynamic characteristics: response time, bandwidth, resolution, Basic measurement system and block diagram	8
II	**Resistive, Inductive and Capacitive Sensors** Resistive sensors: Potentiometer, Strain Gauge Inductive sensors: LVDT, Eddy current sensor Capacitive sensors: displacement and pressure measurement Temperature sensors: RTD, Thermistor, Thermocouple	7
III	**Calibration of sensors and Introduction to Data Acquisition System:** Calibration of Sensors: Need for calibration, Types of calibration: Primary and Secondary Calibration, Static and Dynamic Calibration Types of errors: Gross errors , Systematic errors (instrumental, environmental), Random errors, Absolute, relative, and percentage errors, Error propagation basics Sources of noise: Thermal noise, Flicker noise, Environmental noise Signal-to-noise ratio (SNR), Introduction to DAQ	8

IV	**Smart Sensors and Applications** MEMS sensors (accelerometer, gyroscope, Optical sensors and biosensors Applications in Automotive systems, Biomedical engineering, Environmental monitoring Introduction to sensor interfacing with microcontrollers, Next generation Sensors	7
	Total	**30**

Text Books:

1. D. Patranabis, *Sensors and Transducers*, 2nd ed. New Delhi, India: Prentice Hall of India, 2013.
2. E. O. Doebelin and D. N. Manik, *Measurement Systems: Application and Design*, 6th ed. New York, NY, USA: McGraw-Hill, 2011.
3. A. K. Sawhney and P. Sawhney, *A Course in Electrical and Electronic Measurements and Instrumentation*, New Delhi, India: Dhanpat Rai & Co., 2015.

Reference Books

1. J. Fraden, *Handbook of Modern Sensors: Physics, Designs, and Applications*, 5th ed. Cham, Switzerland: Springer, 2016.
2. G. S. K. Kumar, *Transducers and Instrumentation*, New Delhi, India: McGraw-Hill Education, 2015.
3. S. Tumanski, *Thin Film Magnetoresistive Sensors*, Boca Raton, FL, USA: CRC Press, 2001.
4. S. Middelhoek and S. A. Audet, *Silicon Sensors and Circuits: On-chip Compatibility*, 2nd ed. Boca Raton, FL, USA: CRC Press, 2010.
5. N. Maluf and K. Williams, *An Introduction to Microelectromechanical Systems Engineering*, 2nd ed. Boston, MA, USA: Artech House, 2004.
6. R. P. Jain, *Modern Digital Electronics and Sensor Interfacing*, New Delhi, India: Tata McGraw-Hill, 2018. *(useful for introductory interfacing concepts)*

E-resources:

1. **https://www.udemy.com/course/sensors-and-transducers/?srsltid=AfmBOoodsUTGXJvhy4bgNIWAjTwjjwc8_zHdcIermCEFGNYse0-d_B9a**
2. **https://onlinecourses.nptel.ac.in/noc23_ee105/preview**

Program:	B. Tech. (E &TC)					Semester: II		
Course:	Electronics Skill Lab (DIY)					Code: BET32VS01		
Credit	Teaching Scheme (Hrs./week)				Evaluation Scheme			
	Lecture	Practical	Tutorial	Other	TW	PR	OR	Total
2	-	4	-	-	100	-	-	100

Prior knowledge of: Basic knowledge of physics (electricity), elementary mathematics, and computer fundamentals is Essential

Course Objectives: This course aims at enabling the students to

1. Enable students to develop fundamental understanding of electronic components, devices, circuits, and measurement techniques through structured hands-on experiments.
2. Train students in circuit design, simulation, PCB development, and sensor interfacing using modern tools and standard engineering practices.
3. Provide guided practical exposure in hardware prototyping, soldering, testing, and debugging of electronic systems.
4. Introduce and orient students towards electronics product development, basic VLSI concepts, and real-world industrial practices through experiential learning and industry interaction.

Course Outcomes: After learning the course, the students will be able to:

1. Identify various electronics components with their specifications and measure them with different laboratory instruments, component testers.
2. Implement simple circuits using various sensors with printed circuit boards and tools.

List of Experiments

Expt No.	Description
Module 1: Basic Electronics Fundamentals: Understand basic circuit elements and measurements (4 Hrs)	
1	Identification and measurement of passive components (resistors, capacitors, inductors) using multimeter and verification of resistor color coding.
2	Verification of Ohm's Law by measuring voltage and current in a resistive circuit using a multimeter and plotting the V–I characteristics.
Module 2 : Electronic Instruments : Familiarization with lab instruments (6 Hours)	
3	Measurement of voltage, current, resistance, and signal parameters using Digital Multimeter (DMM), DVM, CRO/DSO, and frequency counter.
4	Generation and analysis of waveforms (sine, square, triangular) using function generator and observation using CRO/DSO.
5	Study and operation of regulated power supply along with assembling and disassembling a simple electronic gadget to understand internal components and working.
Module 3: Component Testing (4 Hours)	
6	Testing of passive and active components (resistors, capacitors, diodes, transistors) using multimeter and component tester for parameter verification.
7	Study and testing of ICs using IC tester to verify functionality and identify faulty ICs.
Module 4: Datasheet Understanding: Develop ability to read and interpret datasheets (4 Hours)	
8	Study of electronic datasheets to understand structure, ratings, specifications, and electrical characteristics of components. Selection of appropriate electronic components based on datasheet specifications for given application requirements.

9	Analysis of datasheets of diode, transistor, and ICs (555 timer/op-amp) including pin configuration and operational parameters.
Module 5: Breadboard Prototyping: Hands-on circuit building (6 Hours)	
10	Study of breadboard structure and implementation of basic circuits (LED and voltage divider) with proper power supply connections.
11	Design and implementation of half wave rectifier circuit on breadboard and analysis of output waveform.
12	Implementation of transistor as a switch on breadboard and troubleshooting of common circuit faults.
Module 6: EDA Tools & Simulation: Circuit design using software tools (6 Hours)	
13	Schematic capture and simulation of basic circuits; verification of Ohm's Law, KCL, and KVL
14	RC circuit transient analysis (charging and discharging characteristics)
15	Simulation of diode characteristics and rectifier circuits (half-wave and full-wave)
16	BJT common-emitter amplifier simulation and gain analysis
Module 7: Introduction to LSI to VLSI: Exposure to modern electronics design (4 Hours)	
17	Evolution: SSI ,MSI ,LSI ,VLSI , Basic idea of IC fabrication , Packaging Standards.
18	Introduction to digital ICs and scaling, Applications in modern electronics
Module 8: Working with different types of sensors and components: Introduction to real-world interfacing (6 Hours)	
19	Interfacing and characterization of basic sensors: temperature, moisture, gas, light, and IR sensors Distance and motion-based sensing systems using ultrasonic sensor, accelerometer, and smoke/fire detection sensors with relay control
20	Actuator and output system integration using DC motors, motor drivers, solar panel, LCD and LED display modules, and pH sensor-based monitoring system
Module 9: PCB Design Techniques: Learn PCB design workflow (14 Hours)	
21	Introduction to soldering and de-soldering techniques using basic electronic components
22	Identification and use of general-purpose PCBs and their layout planning , PCB artwork design for simple circuits using manual or software tools
23	PCB design and implementation of a basic electronic circuit
24	Drilling and preparation of PCB using PCB drillers and safety practices, Use of hand tools in electronics: wire stripping, crimping, cutting, and component mounting
25	Assembly and testing of a complete electronic circuit on fabricated PCB
26	
27	**A Small Home Take Away Project (** as per list but not limited to)**
Module 10: Experiential Learning + Industrial Exposure (8 Hours)	
28, 29, 30	A. Experiential Learning: Learning by doing and reflection Eg (not limited to) Automatic light control using LDR, Temperature monitoring system

	B. Industrial Visit / Expert Interaction: Exposure to real-world practices ● Visit to: PCB manufacturing industry / EMS unit OR Electronics R&D lab / startup ● Observation of: PCB fabrication process , Assembly line and testing , Quality control practices **OR (if visit not feasible):** Expert lecture from industry professional OR Virtual lab/industry tour. **Student Activity:** Visit report submission, Learning reflection
Total	**60**

Reference Books

1.Scherz, Paul and Monk, Simon, Practical Electronics for Inventors, 4th Edition, McGraw-Hill Education, 2016.
2.Platt, Charles, Make: Electronics – Learning by Discovery, 3rd Edition, O'Reilly Media, 2021.
3.Horowitz, Paul and Hill, Winfield, The Art of Electronics, 3rd Edition, Cambridge University Press, 2015.
4.Mitzner, Kraig, Complete PCB Design Using OrCAD Capture and PCB Editor, 2nd Edition, Newnes, 2009.
5.Weste, Neil H. E. and Harris, David Money, CMOS VLSI Design: A Circuits and Systems Perspective, 4th Edition, Pearson, 2011.

Online Resources

1.National Instruments Multisim tutorials
2.Texas Instruments application notes
3.Analog Devices design resources

**** Small Home Take Away Project Ideas (Simple Sensor Based)**

1.Automatic room light control using LDR (Light Sensor)
2.Temperature-based fan speed control using temperature sensor
3.Soil moisture-based automatic plant watering system
4.Gas leakage detection system using gas sensor with alarm
5.Smart dustbin with IR sensor for automatic lid opening
6.Water level indicator using ultrasonic sensor
7.Fire and smoke alarm system using smoke sensor
8.Simple obstacle detection robot using IR sensor and DC motor

Program:	B. Tech. (E &TC)						Semester:	II
Course:	Universal Human Values						Code:	BSH32VE02
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	2	-	-	-	25	25	-	50

Course Objectives: This course aims at enabling students,

1. To appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
2. To facilitate the development of a holistic perspective among students to lead their personal and professional lives in an ethical way.
3. To highlight plausible implications of such a holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour, and mutually enriching interaction with nature.

Course Outcomes: After learning the course, the students should be able to:

1. Illustrate the relevance of Universal Human Values using real-life examples from personal, social, and professional contexts.
2. Interpret a human being as the co-existence of 'Self' and 'Body'.
3. Apply the concept of harmony in family and society to given scenarios with appropriate value-based actions.
4. Apply Universal Human Values to promote coexistence with nature in personal and professional life.

Detailed Syllabus

Unit	Description	Duration [Hrs]
I	**Introduction to Value Education:** 1. Understanding Value Education 2. Self-exploration as the Process for Value Education 3. Continuous Happiness and Prosperity 4. Right Understanding 5. Current Scenario 6. Method to fulfil the Basic Human Aspirations	4
	Sharing Session: 1. Sharing about Oneself 2. Exploring Human Consciousness 3. Exploring Natural Acceptance	3
II	1. Harmony in the Human Being: 2. Human being: the Co-existence of the Self and the Body 3. Needs of the Self and the Body 4. The Body as an Instrument of the Self 5. Understanding Harmony in the Self 6. Harmony of the Self with the Body 7. Programme to Ensure Self-Regulation and Health	4
	Sharing Session: 1. Exploring the Difference between Needs of Self and Body 2. Exploring Sources of Imagination in the Self 3. Exploring Harmony of Self with the Body 4. AI Integration: Personal Habit Analysis	4

III	**Harmony in the Family and in Society:** 1. Harmony in the Family 2. 'Trust'—the Foundational Value in Relationship 3. 'Respect'—the Right Evaluation 4. Other feelings (Values) in Human-to-Human Relationship 5. Understanding Harmony in Society 6. Vision for the Universal Human Order 7. Five Dimensions of Human Order	4
	Sharing Session: 1. Exploring the Feeling of Trust 2. Exploring the Feeling of Respect and Exploring Systems to 3. Fulfil Human Goal	3
IV	**Harmony in Nature/Existence:** 1. Understanding Harmony in Nature, 2. Realizing Existence as Coexistence at All Levels 3. The Holistic Perception of Harmony in Existence **Implications of Holistic Understanding: A Look at Professional Ethics:** 4. Definitiveness of (Ethical) Human Conduct 5. Humanistic Constitution and Universal Human Order 6. Competence in Professional Ethics 7. Holistic Technologies, Production Systems and Management Models -Typical Case Studies 8. Strategies for Transitioning towards Value-Based Life and Profession.	4
	Sharing Session: 1. Exploring the Four Orders of Nature 2. Exploring Co-existence in Existence 3. Exploring AI for Holistic Technologies 4. Exploring Humanistic Models in Education 5. Exploring Steps of Transition towards Universal Human Order	4
	Total	**30**

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2019, A Foundation Course in HUMAN VALUES and Professional Ethics- Presenting a universal approach to value education through self-exploration, Excel Books

Reference Books:

1. P.L. Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
2. A. Nagaraj, 1999, JeevanVidya: EkParichaya, JeevanVidyaPrakashan, Amarkantak,
3. A. N. Tripathy, 2003, Human Values, New Age International Publishers.
4. E. G. Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
5. M. Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics and Human Values, Eastern Economy Edition, Prentice Hall of India Ltd.
6. B. P. Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
7. B. L. Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

e-sources:

1. http://madhyasth-darshan.info/postulations/knowledge/knowledge-of-humane-conduct/
2. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
3. https://youtu.be/OgdNx0X923I

Program:	B. Tech. (E & TC)					Semester: II	
Course:	Professional English					Code:	BSH32AE02
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	30	20	-	50

Prior knowledge of: Basic English communication

Course Objectives: This course aims at enabling students to:

1. Apply professional branding principles to technical career documentation and digital profiles
2. Employ strategic oral communication tactics during formal recruitment and networking scenarios.

Course Outcomes: After learning the course, the students will be able to:

1. Network professionally by applying self-introduction, profile building, and workplace communication etiquette.
2. Compose professional career documents such as resumes, cover letters, and workplace reports using appropriate language and format.
3. Articulate ideas clearly across contexts such as debates, interviews and presentations by analyzing own and peer performance.

Detailed Syllabus

Expt. No	Suggested List of Experiments	Duration (Hrs)
1	**Develop a Self-Introduction and Elevator Pitch:** Develop and deliver a structured self-introduction suitable for professional networking.	**2**
2	**Write a Professional 'About Me' Column:** Write a well-structured "About Me" section in correct and formal language for a professional profile, ensuring clarity, coherence, and appropriate tone.	**2**
3	**Create a Complete Skills Profile for Professional Networking:** Draft a complete 'Skills' profile by effectively presenting strengths and achievements; critically evaluate peer profiles against recruiter checklists.	**2**
4	**Display Professional Tact and Diplomacy in Workplace Interactions:** Role-play scenarios: delivering constructive criticism on a peer's work, responding to negative feedback from a supervisor, communicating a project setback to a client. Analyse language choices for tone and professionalism.	**2**
5	**Telephone & Video Call Etiquette for the Workplace:** Practise professional communication in phone calls and virtual meetings (Teams/Zoom): opening and closing calls, active listening without visual cues, handling technical difficulties gracefully and maintaining politeness & professionalism in hybrid work environments.	**2**

6	**Analyse Resume/CV Drafts:** Evaluate resumes based on clarity, relevance, formatting, and use of action verbs, and suggest improvements. Understand what develops ATS friendly resumes.	**2**
7	**Construct a Professional Resume/CV:** Construct a structured and well-formatted resume that highlights educational background, technical skills, projects, and achievements using appropriate language and formatting conventions.	**2**
8	**Construct a Role-Specific Cover Letter:** Construct a tailored cover letter aligning personal skills and experiences with job requirements using persuasive language.	**2**
9	**Learn Strategies for Workplace Meetings & Minutes:** Participate in a simulated team meeting; practise agenda-setting and turn-taking. Write formal minutes from the discussion.	**2**
10	**Draft Technical & Business Reports**: Practise writing short technical reports, progress reports, and business memos tailored to engineering workplace contexts. Focus on structure, objectivity, conciseness, and appropriate use of data/visuals in written communication.	**2**
11	**Using English effectively in Debates:** Participate in debates to express and justify opinions logically and confidently	**2**
12	**Interview Techniques (STAR Method):** Apply structured interview techniques to respond effectively to questions with clarity and relevance.	**2**
13	**Mock Interviews:** Evaluate interview responses based on clarity, confidence, and content, and provide constructive feedback.	**2**
14	**Deliver a Short Talk on a Given Topic:** Deliver a structured short talk on a general or technical topic, focusing on content organisation, clarity of expression, confidence, and effective verbal and non-verbal communication.	**2**
15	**Present an Integrated Professional Task:** Present a business proposal or idea and participate in a group demonstrating integrated communication skills.	**2**
	Total	**30**

Text Books:

1. Sharma, S. D. *A Text-Book of Professional Communication Skills and ESP for Engineers and Professionals*. Sarup & Sons, 2021.
2. Bovee, Courtland L., and John V. Thill. *Business Communication Today*. 14th ed., Pearson Education, 2022
3. *Communication Skills in English for Engineers and Technologists*, Latest Edition (2025/26) – Arati A. Agrawal, CBS Publishers & Distributors Pvt. Ltd.

Reference Books:

1. *The Handbook of Communicating Science and Engineering*, 2023 Edition – Felice Frankel, MIT Press
2. *Business Communication Today*, 14th Edition (2022) – Courtland L. Bovee & John V. Thill, Pearson Education
3. *Professional Engineering Communication*, Latest Edition (IEEE PCS Series), IEEE Press / Wile

E Resources

1. "Learn English: Careers." *British Council*, 2026,https://learnenglish.britishcouncil.org/careers.
2. "Resumes, CVs and Cover Letters." *Engineering Career Resource Center*, University of Michigan, 2026,https://career.engin.umich.edu/resumes-cvs-cover-letters/.

Program:	B. Tech. (E & TC)						Semester: II	
Course:	German						Code:	BSH32AE03
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	TW	OR	PR	Total
1	-	2	-	-	30	20	-	50

Prior knowledge of: English Language is essential.

Course Objectives: This course aims at enabling students to,

1. Get familiar with the basics of German language and develop their interest in the language.
2. Develop basic German language skills for understanding and using simple expressions in everyday situations.
3. Use digital and AI-supported tools to practice German and support independent learning.

Course Outcomes: After learning the course, the students should be able to:

1. Interpret relevant information from spoken and written German communication.
2. Construct simple German sentences using basic vocabulary and grammatical structures.
3. Apply digital and AI-assisted tools for German phonetic skills.

Detailed Syllabus

Lab	Activities	Duration (Hrs)
1	**Reading and Matching:** Identify and match German words and expressions with pictures, practice pronunciation, and use the vocabulary in simple spoken and written sentences.	2
2	**Listening for Key Information:** Listen to short conversations multiple times, note key details, verify answers in pairs, and respond to follow-up comprehension tasks.	2
3	**Pronunciation Practice:** Practice German sounds through guided repetition, reading aloud, peer correction, and short speaking exercises.	2
4	**True/False Comprehension:** Read short texts, evaluate statements, justify answers, and reformulate incorrect statements correctly.	2
5	**Reading and Form Completion:** Read personal profiles or short texts, extract relevant information, and complete structured forms followed by discussion.	2
6	**Vocabulary Mind Map: C**ollect topic-based vocabulary, org anize it into mind maps, and use the words in short oral or written tasks.	2
7	**Grammar Gap-Fill Task:** Complete grammar exercises, identify rules used, and apply structures in new example sentences.	2
8	**Sentence Construction Activity:** Construct sentences using target verbs, expand them with additional information, and practice speaking in pairs.	2
9	**Error Detection and Correction:** Analyze sentences, identify grammatical errors, correct them, and explain the corrections collaboratively.	2
10	**Self-Introduction Presentation:** Prepare, practice, and present a short self-introduction followed by peer interaction and feedback.	2

11	**Question–Answer Interaction:** Practice asking and answering personal questions through guided drills, pair conversations, and role-switch activities.	2
12	**Dialogue Role-Play:** Read model dialogues, adapt them to new situations, rehearse, and perform role-plays in groups.	2
13	**Pronunciation Practice using AI:** Record speech using AI tools, compare feedback, improve pronunciation, and perform short speaking tasks.	2
14	**Dialogue Building Using AI:** Generate dialogues using AI support, edit language structures, rehearse, and perform communicative role-plays.	2
15	**AI-Supported Profile Writing:** draft a short profile, review AI suggestions critically, revise the text, and share final versions for discussion.	2
	Total	**30**

Text Books:

1. Menschen A1.1: Sandra Evnas, Angela Pude, Franz Pecht, Hueber Verlag Ismaning Germany, 2016

Reference Books:

1. Netzwerk A1: Dengler, Rusch, Schmitz, Sieber, Ernst Klett Sprachen, Stuttgart Germany, Goyal Publishers & Distributors, Delhi, 2015
2. Linie 1: Kaufmann, Moritz, Rodi, Rohrmann, Sonntag,Klett-Langenscheidt GmbH, München Germany, Goyal Publishers & Distributors, Delhi, 2018
3. Tangram aktuell 1: Dallapiazza, Eduard von Jan, Schönherr, Max Hueber Verlag, Ismaning, Germany, Goyal Publishers & Distributors, Delhi, 2005

e-sources:

1. NPTEL Course lectures (IIT Madras) link: https://onlinecourses.nptel.ac.in/noc25_hs121/preview
2. DW Learn link: https://learngerman.dw.com/en/beginners/s-62078399
3. Goethe-Institut Link: https://www.goethe.de/en/spr/ueb/ele.html
4. Easy German link: https://www.easygerman.org
5. Deustschlandlabor: https://learngerman.dw.com/de/das-deutschlandlabor/c-53074503

Program:	B. Tech (E & TC)			Semester:		II		
Course:	Japanese			Code:		BSH32AE05		
Teaching Scheme (Hr/Week)				Evaluation Scheme				
Credit	Lecture	Practical	Tutorial	FA		TW	Oral	Total
				FA1	FA2			
1	-	2	-			30	20	50

Prior Knowledge of: 1. English/Marathi/Hindi language for learning Japanese language.

Course Objectives: This course aims at enabling students

1. To be aware of Japanese Scripts (Hiragana, Katakana) and basic Kanjis
2. To express themselves using basic sentences and develop cross cultural skills and understanding of gestures, family and community, perceptions.
3. To develop language skills namely Listening, Speaking, Reading and Writing skills for socializing, at basic level.

Course Outcomes: After learning the course, the students will be able to

1. Identify Japanese scripts through oral and written communication.
2. Demonstrate the basic Kanjis with meanings in the given sentence.
3. Construct simple demonstrative sentences for daily use.

Unit	Description	Hrs.
I	Introduction to Japanese Scripts: 'Hiragana','Katakana' Practice Hiragana characters using stroke order sheets and guided writing exercises.	12
II	Introduction to basic Kanjis: Write basic Kanji with stroke order, meaning, and On/Kun readings.	8
III	**Basic Grammar:** Use of grammar and vocabulary.	10

Practical/Lab sessions		
Lab sessions	**Activities**	**Duration (Hrs)**
1	Introduction to 'Hiragana'	2
2	Hiragana practice	2
3	Hiragana listening practice	2
4	Introduction to Katakana	2
5	Katakana practice	2
6	Vocabulary practice	2
7	Introduction to Kanjis	2
8	Kanji practice	2
9	Recognizing Kanjis.	2
10	Kanji chart preparation	2
11	Introduction to Basic Grammar	2
12	Vocabulary Development	2
13	Sentence Construction	2
14	Dialogue Practice	2
15	Reading and Grammar Identification	2
	Total	**30**

Textbook:

1. Minna no Nihongo Part I and II Publication: GOYAL PUBLISHERS & DISTRIBUTORS PVT. LTD., Author: TsuruoYoshiko (Compiled), Edition:2018
2. Nihongo ShohoPublication: JALTAP, Author:JALTAP(With pe rmission of Japan Foundation, Tokyo), Edition: April 2008

Reference Books:

1. MOMO Author: Japan Foundation, NewDelhi, Publication: Goyal Publisher & Distributors(P) Ltd., Edition: October2007
2. MOMO Japanese workbook Japan Foundation, New Delhi, Publication: Goyal Publisher & Distributors(P)Ltd., Edition: October2007
3. MOMO Japanese workbook Japan Foundation, New Delhi, Publication: Goyal Publisher & Distributors(P)Ltd., Edition:October2007

Program:	B. Tech. (E & TC)					Semester: II	
Course:	Business Storytelling					Code:	BSH32AE05
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	30	20	-	50

Prior knowledge of: Basic knowledge of the English language is essential.

Course Objectives: This course aims at enabling students:
1. To develop understanding of storytelling elements and communication techniques.
2. To enable effective communication of ideas through creative writing and storytelling activities.

Course Outcomes: After learning the course, the students will be able to
1. Illustrate storytelling elements and techniques to improve comprehension.
2. Construct business narratives to present products, services, and organizational initiatives.
3. Analyze storytelling strategies impacting communication and decision-making in business contexts.

Sr. No.	Suggested List of Experiments/Activity	Duration [Hrs]
1	**The Bridging Session:** Discuss storytelling elements with reference to the short story *The Bet* by Anton Chekhov to illustrate their role in story writing.	2
2	**Rewriting a Turning Point:** Draft an alternate version of the given story by changing just that part.	2
3	**Basics of Storytelling:** Using Five Senses in a storytelling activity and elements of storytelling	2
4	**Dialogue Writing:** Writing dialogues for given situations to practice creating natural conversations that reveal character emotions and advance the narrative.	2
5	**What Else?:** Analysis of a self-written story using AI for perspective, detail and improvement.	2
6	**Story from News:** Convert a news headline into a narrative.	2
7	**Product Journey Story:** Journey of a product from Idea, Design, Market Launch, Failure/Success to Customer Feedback.	2
8	**Customer Success Story:** Craft a narrative that showcases a customer's journey with your fictional business.	2
9	**Business Origin Story:** Research and narrate a significant origin of a well-known business, focusing on how storytelling played a role in shaping its image in public.	2

10	**Social Impact Story:** Develop a story that demonstrates how a business initiative or project positively impacted a community or addressed a social issue.	2
11	**Data to Story:** Convert statistical data into narrative	2
12	**Analysis of Story of Leaders:** Highlight a leader's ability to motivate, inspire, and guide a team toward success.	2
13	**Technical Narration:** Simplify technical concepts through storytelling for non-technical audiences.	2
14	**Ethical Decision-Making Scenario:** Present a complex ethical dilemma faced by a business or individual. Use storytelling to explore various perspectives and potential solutions	2
15	**Crisis Communication Case:** Examine a business crisis scenario and analyze how effective communication strategies can help restore trust and reputation.	2
	Total	**30**

Reference Books:

1. Rob Biesenbach, Unleash the Power of Storytelling: Win Hearts, Change Minds, Get Results, East lawn Media, 2018.
2. Yiannis Gabriel, Storytelling in Organizations: Facts, Fictions, and Fantasies, Oxford University Press, 2011.
3. Kendall Haven, Story Smart, Libraries Unlimited, 2014
4. Sandeep Das, How Business Storytelling Works, Penguin Random House, 2023

Program:	B. Tech. (E & TC)					Semester: II	
Course:	Life Skills 2					Code:	BSH32CC02
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	50	-	-	50

Prior knowledge of: Basic understanding of concepts covered in Life Skills I.

Course Objectives: This course aims at enabling students to:

1. To introduce students to adaptability, inclusive behaviour, social responsibility and professional etiquette.
2. To enable students to practice ethical decision-making, life management skills and career planning strategies for effective professional development.

Course Outcomes: After learning the course, the students will be able to:

1. Describe the role of adaptability, social responsibility, and professional etiquette in academic and workplace situations.
2. Apply ethical reasoning, time management and basic financial planning to achieve academic and personal goals.
3. Prepare a structured career development plan according to the industry trends through professional networking

Detailed Syllabus

Expt. No	Suggested List of Experiments	Duration (Hrs)
1	Demonstrate Learning Agility: Demonstrate adaptability by responding to changing scenarios through simulation activities and reflection.	**2**
2	Practice Social Responsibility: Participate in eco-friendly or community service activities and study the Goonj case study to promote sustainable practices and community responsibility.	**2**
3	Learn Inclusive Behaviour: Engage in role plays and discussions to respect cultural and individual differences.	**2**
4	Demonstrate Workplace Etiquette: Demonstrate punctuality, accountability and professional communication through simulated workplace scenarios.	**2**

5	Collaborate on a Sustainability Challenge: Work in teams to design a small eco-friendly initiative while demonstrating inclusive behaviour, adaptability and professional communication.	**2**
6	Analyze Ethical Decision-Making: Analyze ethical dilemmas through case studies to identify fair and responsible decisions.	**2**
7	Organize Tasks Using Time Management Techniques: Organize academic tasks using priority-setting tools such as schedules or to-do lists.	**2**
8	Implement Anti-Procrastination Strategies: Practice habit stacking and the 5-minute rule to overcome procrastination.	**2**
9	Demonstrate Financial Literacy Skills: Demonstrate basic financial management through budgeting exercises and use AI tools to analyse spending patterns and digital transactions.	**2**
10	Life Management Scenario: Work in groups to solve a real-life scenario involving ethical choices, task planning, budgeting and managing procrastination.	**2**
11	Develop Strategic Professional Identity: Develop a short professional self-introduction highlighting personal strengths and professional skills.	**2**
12	Map Professional Relationships: Identify mentors, peers and career connections through a network map to see how relationships create opportunities.	**2**
13	Examine Industry Trends: Examine emerging industry trends and relate them to personal career goals.	**2**
14	Design a Personal Career Development Plan: Design a project outlining career goals and skill development strategies.	**2**
15	Present a Professional Development Portfolio: Present a portfolio demonstrating the role of adaptability and ethics in professional life.	**2**
	Total	**30**

Reference Books:

1. "Mindset: The New Psychology of Success" by Carol S. Dweck Publisher: Ballantine Books
2. "The Financial Diet: A Total Beginner's Guide to Getting Good with Money" by Chelsea Fagan and Lauren VerHage 3.
"Grit: The Power of Passion and Perseverance" by Angela Duckworth Publisher: Scribner, 2018

E Sources -

1. Skills You Need (www.skillsyouneed.com): This website offers comprehensive information and practical guidance on a wide range of life skills, including communication, time management, problem-solving, and more 2. Mind Tools (www.mindtools.com): Mind Tools provides resources on personal effectiveness, leadership, communication skills, and other essential life skills to enhance professional and personal development
3. TED Talks (www.ted.com): TED Talks offer inspiring and informative speeches by experts and thought leaders covering various life skills topics, including resilience, emotional intelligence, and personal growth
4. Very well Mind (www.verywellmind.com): This website covers mental health, emotional well-being, and self improvement topics that contribute to overall life skills development

Vision and Mission of Applied Sciences and Humanities (AS & H) Department

Vision

To provide value-added quality education that promotes essential technical skills, critical-thinking, communication skills and human values to make impactful contributions to the society.

Mission

Being a student-centric department, our mission is –

1. To develop a strong base of engineering sciences through innovative and experiential learning.
2. To provide excellent harmony of conducive environment and moral support for joyful learning.
3. To strive for overall development of students by providing the right platform to nurture all personality traits.
4. To create research attitude and endeavor innovation, creativity.

Vision and Mission of E & TC Engineering Department

Vision

To establish as a premier E & TC engineering department in Maharashtra in the coming five years by providing quality education, fostering innovation with ethical values to serve the society.

Mission

1. Fostering value-based education to achieve academic excellence with the right attitude and professional ethics.
2. Inculcating a culture of research and innovation, with an aim of serving society in a sustainable manner.
3. Developing skilled E & TC engineers with an ability to provide solutions to meet national and global challenges in accordance with the needs of the society.