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 & Syllabus
Of
First Year B. Tech. Computer Engineering (Regional Language)
(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 & Humanities

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS chairman
1.	Linear Algebra & Univariate Calculus	BSH31BS01	10	
2.	Linear Algebra & Univariate Calculus – Laboratory	BSH31BS02	12	
3.	Engineering Physics	BSH31BS03	14	
4.	Engineering Physics Laboratory	BSH31BS04	17	
5.	Constitution of India	BSH31VE01	25	
6.	Communicative English	BSH31AE01	27	
7.	Life Skills 1	BSH31CC01	30	
8.	Multivariate Calculus	BSH32BS12	34	
9.	Multivariate Calculus laboratory	BSH32BS13	36	
10.	Engineering Chemistry	BSH32BS9	38	
11.	Engineering Chemistry Laboratory	BSH32BS10	41	
12.	Universal Human Values	BSH32VE02	49	
13.	Professional Eng/Ger/Jap/Business Story Telling	BSH32AE02/ 03/04/05	51/53/55 /57	
14.	Indian Knowledge System	BSH32IK02	59	
15.	Life Skills 2	BSH32CC02	61	

Board of Studies - Department of Computer Engineering (Regional Language)

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS chairman
1	Computational Thinking & Problem Solving	BCER31ES01	18	
2	Digital Electronics and Computer Organization	BCER31ES02	20	
3	Web Development Laboratory	BCER31VS01	23	
4	Object Oriented Programming	BCER32ES01	42	
5	Discrete Mathematics	BCER32ES02	45	
6	Data Exploration and Visualization Laboratory	BCER32PC01	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
14	CC	Co-Curricular 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	Vocational and Skill Enhancement Course	**1**	**2**	**5**
4	Ability Enhancement Course	**2**	**4**	**10**
5	Program Core Course	**1**	**2**	**5**
6	Indian Knowledge System	**1**	**2**	**5**
7	Value Education Course	**2**	**4**	**5**
8	Cocurricular Courses /Liberal Learning 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	Vocational and Skill Enhancement Course	**1**	**-**							**1**
4	Program Core Course	**-**	**1**							**1**
5	Ability Enhancement Course	**1**	**1**							**2**
6	Indian Knowledge System	-	**1**							**1**
7	Value Education Course	**1**	**1**							**2**
8	Co curricular Courses /Liberal Learning 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	Vocational and Skill Enhancement Course	**2**	**-**							**2**
4	Program Core Course	**-**	**2**							**2**
5	Ability Enhancement Course	**1**	**1**							**2**
6	Indian Knowledge System	-	**2**							**2**
7	Value Education Course	**2**	**2**							**4**
8	Cocurricular Courses /Liberal Learning Courses	**1**	**1**							**2**
	Total	**20**	**20**							**40**

CURRICULUM STRUCTURE

First Year B. Tech Computer Engineering (Regional Language) (Academic Regulations 2026)																		
(With effect from Academic Year 2026-27)																		
Semester I																		
			Credit Scheme				Teaching Scheme(Hours/ Week)					Evaluation Scheme and Marks						
Course Code	**Course Type**	**Course Name**	**L**	**P**	**T**	**Total**	**L**	**P**	**T**	**O**	**Total**	**FA1**	**FA2**	**SA**	**TW**	**PR**	**OR**	**Total**
BSH31BS01	BSC	Linear Algebra & Univariate Calculus	2	-	-	2	2	-	-	1	3	10	10	30	-	-	-	50
BSH31BS02	BSC	Linear Algebra & Univariate Calculus – Laboratory	-	1	-	1	-	2	-	-	2	-	-	-	50	-	-	50
BSH31BS03	BSC	Engineering Physics	3	-	-	3	3	-	-	1	4	20	20	60	-	-	-	100
BSH31BS04	BSC	Engineering Physics Laboratory	-	1	-	1	-	2	-	-	2	-	-	-	50	-	-	50
BCER31ES01	ESC	Computational Thinking and Problem Solving	2	1		3	2	2	-	2	6	10	10	30	25	25	-	100
BCER31ES02	ESC	Digital Electronics and Computer Organization	3	1	-	4	3	2	-	3	8	20	20	60	25	25	-	150
BCE31VS01	VSEC	Web Development Laboratory	-	2	-	2	-	4	-	-	4	-	-	-	50	-	50	100
BSH31VE01	VEC	Constitution of India	2	-	-	2	2	-	-	-	2	25	25	-	-	-	-	50
BSH31AE01	AEC-I	Communicative English	-	1	-	1		2	-	-	2	-	-	-	30	-	20	50
BSH31CC01	CC	Life Skills 1	-	1	-	1	-	2	-	-	2	-	-	-	50	-	-	50
		Total	**12**	**8**	**0**	**20**	**12**	**16**	**0**	**7**	**33**	**85**	**85**	**180**	**305**	**25**	**70**	**750**

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 to the separate document. Exit Policy (If required)

CURRICULUM STRUCTURE

First Year B. Tech Computer Engineering (Regional Language) (Academic Regulations 2026)																		
(With effect from Academic Year 2026-27)																		
Semester II																		
Course Code	**Course Type**	**Course Name**	**Credit Scheme**				**Teaching Scheme (Hours/ Week)**					**Evaluation Scheme and Marks**						
			L	**P**	**T**	**Total**	**L**	**P**	**T**	**O**	**Total**	**FA1**	**FA2**	**SA**	**TW**	**PR**	**OR**	**Total**
BSH32BS12	BSC	Multivariate Calculus	2	-	-	2	2	-	-	1	3	10	10	30	-	-	-	50
BSH32BS13	BSC	Multivariate Calculus laboratory	-	1	-	1	-	2	-	-	2	-	-	-	50	-	-	50
BSH32BS09	BSC	Engineering Chemistry	3	-	-	3	3	-	-	1	4	20	20	60	-	-	-	100
BSH32BS10	BSC	Engineering Chemistry Laboratory	-	1	-	1	-	2	-	-	2	-	-	-	50	-	-	50
BCER32ES01	ESC	Object Oriented Programming	2	1	-	3	2	2	-	2	6	10	10	30	25	25	-	100
BCER32ES02	ESC	Discrete Mathematics	2	-	-	2	2	-	-	2	4	10	10	30	-	-	-	50
BCER32PC01	PCC	Data Exploration and Visualization Laboratory	-	2	-	2	-	4	-	-	4	-	-	-	50	-	50	100
BSH32VE02	VEC	Universal Human Values	2	-	-	2	2	-	-	-	2	25	25	-	-	-	-	50
BSH32AE02/ 02/04/05	AEC	(Professional Eng /Ger/Jap/Business story telling)	-	1	-	1	-	2	-	-	2	-	-	-	30	-	20	50
BSH32IK02	IKS	Indian Knowledge System	2	-	-	2	2	-	-	-	2	25	25	-	-	-	-	50
BSH32CC02	CC	Life Skills 2	-	1	-	1	-	2	-	-	2	-	-	-	50	-	-	50
		Total	**13**	**7**	**0**	**20**	**13**	**14**	**0**	**6**	**33**	**100**	**100**	**150**	**255**	**25**	**70**	**700**

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 to the separate document Exit Policy (If required)

Curriculum

Semester I

Program:	B. Tech. Computer Engineering (Regional Language)						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 modeling 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 indeterm
3. inate forms, Taylor's and Maclaurin's expansions.
4. Solve first-order differential equations and higher-order linear differential equations.
5. 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. Computer Engineering (Regional Language)					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. Computer Engineering (Regional Language)				Semester			I
Course:	Engineering Physics				Code:			BSH31BS03
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. 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 Optics, Semiconductor Physics, and Quantum Physics, Acoustics
2. Introduce recent advances in Physics, including Nanotechnology, Superconductivity and Lasers
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. Interpret thin film interference, laser operation, and applications using wave optics and light–matter interaction
2. Illustrate electrical behaviour of solids using band theory and charge carriers
3. Analyse quantum behaviour of particles using wave–particle duality and the Schrödinger equation
4. Describe acoustic factors influencing building design and principles of non-destructive testing techniques for assessing material integrity
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	**Wave Optics and Lasers** Wave Optics Interference: Interference, phase difference & path difference between waves, constructive & destructive interference, geometrical path & optical path, phase difference due to reflection at boundaries of optical interfaces, thin film, interference due to thin film of uniform thickness, conditions of maxima and minima, interference at wedge shaped film (without derivation), anti-reflection coating as an application of interference 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	8

II	**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)	7
III	**Quantum Mechanics** 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	7
IV	**Acoustics and Non-Destructive Testing** Acoustics: Absorption, echo, reverberation and time of reverberation, Sabine's formula, coefficient of absorption, quality of sound (pitch, timbre, loudness, intensity level) factors affecting acoustics of a building and their remedies (reverberation, adequate loudness, focusing due to walls and ceilings, echoes, echelon effect, balconies, seating arrangement, extraneous noise and sound insulation, freedom from resonance) Non-Destructive Testing: Introduction to non-destructive testing (NDT), importance of NDT techniques, types of NDT techniques - Liquid penetrant testing, Magnetic particle inspection, Eddy current testing, Thermal inspection, Acoustic Emission, Pressure and Leak Testing, Ultrasonic Testing (UT), Radiography testing (principle, advantages, limitations, and applications)	8
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, electronics, energy, automobile, space, defense, introduction to quantum computing.	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
7. Introduction to Superconductivity – Michael Tinkham, Dover India Edition

Program:	B. Tech. Computer Engineering (Regional Language)						Semester: I	
Course:	Engineering Physics Laboratory						Code:	BSH31BS04
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: After successful completion of this course, students will be able to:

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. Computer Engineering (Regional Language)						Semester				I
Course:	Computational Thinking & Problem Solving						Code: BCER31ES01				
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks						
	Lecture	Practical	Tutorial	Other	FA		SA	TW	OR	PR	Total
					FA1	FA2					
3	2	2	-	2	10	10	30	25	-	25	100

Prior knowledge of Basic mathematics **is essential.**

Course Objectives: This course aims at enabling students,

1. To develop computational thinking and structured problem-solving skills.
2. To apply programming concepts to solve problems.
3. To design algorithms and implement solutions for real-world problems.
4. To utilize data structures and logical constructs effectively.
5. To build applications integrating programming to solve problem

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

1. Apply computational thinking and algorithmic approaches to solve problems.
2. Develop programs using variables, data types, and operators.
3. Design efficient programs and perform data processing using control structures, functions and data structure
4. Design and develop real-world applications integrating programming tools.

Detailed Syllabus

Unit	Description	Duration [Hrs]
I	**Computational Thinking** Introduction, Logical Thinking and Decision Making, Problem-solving approaches: Top-down, Bottom-up, Algorithms, Flowcharts, Pseudocode, Flowchart tools (Flowgorithm, Lucidcharts etc.), Unsolvable Problems, Introduction to Git for version control **Self Study:** Algorithm Testing & Competitive Platforms, AlphaCode, visualgo	8
II	**Programming Fundamentals** Introduction to Programming, compiler, interpreter, Linker, Loader, Variables, Data types, Input/Output, Operators and expressions, debugging tools (pdb, logging, pytest) **Self Study:** Error Handling and Exception Management, memory management, Pythontutor	6
III	**Control Structures, Functions and Data Handling** Decision making (if-else), Looping constructs, Functions and modular programming, Recursion, Array, Lists, Strings, Dictionaries, Searching and Sorting, Problem-solving patterns, File handling basics **Self-Study**: Code Readability and Documentation	8

IV	**Real-World Problem Solving** Mapping real-life problems to computational models, Modular design approach, Introduction to APIs, Fetching and handling data from APIs, Basic handling of JSON data **Self Study:** Prompt engineering for code generation, Code debugging and optimization	8
	Total	**30**

Suggested Lab Assignments

1. **Magic Square Generation:** Fill an N×N grid such that sums are equal in all directions
2. Determine whether repeatedly applying the rule (divide by 2 if even, multiply by 3 and add 1 if odd) to any positive integer always leads to 1.
3. Solve a matching problem where **N students and N companies** each provide preference lists, and assignments must be made such that **no student–company pair would prefer each other over their current match (stable matching)**; illustrate the process manually, design an algorithm/flowchart.
4. Design and implement a solution to solve a **9×9 Sudoku puzzle**, where some cells are pre-filled and the remaining must be completed such that each number from 1 to 9 appears exactly once in every row, column, and 3×3 subgrid; illustrate the solving process for a given puzzle, develop an algorithm using appropriate problem-solving techniques and ensure the final grid satisfies all constraints.
5. Create a calculator that tracks daily activities (calories, expenses, screen time) and provides insights based on user input.
6. Design a menu-driven application for campus needs (canteen orders, timetable, or event registration) using functions and control structures.
7. Build a system to store, search, and update contacts or personal notes using file handling features.
8. Mini Project: Real-World App Builder Develop a small application such as:
   - AI chatbot for FAQs
   - Weather app using API
   - Expense tracker with insights
   - Study planner with reminders

Text Books:

1. Computational Thinking: First Algorithms, Then Code by Paolo Ferragina, Fabrizio Luccio, Springer Nature, 2024, ISBN 9783031599217
2. Mr. G. Pradeep, Ms. A. Sunanda Christy Kumari, “Computational Thinking: Foundations, Algorithms, and Problem-Solving”, ISBN: 9789356022089

Reference Books:

1. Becoming a Computational Thinker by Paul S. Wang, Chapman & Hall/CRC Press, 2024, ISBN 9781003821335
2. Nakashima Hirata, “Computational Thinking: Rethinking How We Think ”, Apr 2026, ISBN 978-981-95-5961-9

E-resources:

1. https://nptel.ac.in/courses/106104074 ,Introduction to problem-solving and programming by Prof. D. Gupta, IIT Kanpur.
2. https://egyankosh.ac.in/handle/123456789/75141, IGNOU Self Learning Material on problem solving and programming.

Program:		B. Tech. Computer Engineering (Regional Language)										Semester: I
Course :		Digital Electronics & Computer Organization										Code : BCER31ES02
Credits		Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks						
						FA		SA	TW	OR	PR	Total
L	P	Lecture	Practical	Tutorial	Other	FA1	FA2					
3	1	3	2	-	3	20	20	60	25	25	-	150

Prior knowledge of Logic Gates **is essential.**

Course Objectives: This course aims at enabling students,

1. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
2. To understand the concepts of combinational logic circuits.
3. To apply the knowledge of flip-flops, counter and Registers to design sequential circuits
4. To understand the concept of computer organization.
5. To understand the concept of memory systems.

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

1. Interpret Boolean expressions for designing digital circuits using K-Maps.
2. Design Combinational digital circuits as per the specifications.
3. Apply the concepts of sequential circuits to categorize registers and counters
4. Analyze the concepts of computer organization, input-output
5. Identify memory systems and processor organization

Guidelines for Students:

1. The laboratory assignments are to be submitted by students in the form of a journal.
2. The journal consists of certificate, table of contents and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, Software & Hardware requirements, Date of Completion, assessor's sign, Theory- Concept, circuit diagram, pin configuration, conclusion/analysis).

Guidelines for Laboratory/Term Work Assessment:

a. Continuous assessment of laboratory work is done based on overall performance and Laboratory performance of students.
b. Each Laboratory assignment assessment should assign grade/marks based on parameters with appropriate weightage.
c. Suggested parameters for overall assessment as well as each Laboratory assignment assessment include timely completion, performance, innovation, efficiency, punctuality and neatness.

Guidelines for Laboratory Conduction

- Assignments are mandatory to perform either on digital trainer kit or online simulator
- Students are expected to work in groups of 3 to 4.
- Tools recommended: Open-source simulator

Detailed Syllabus		
Unit	**Description**	**Duration [Hrs]**
I	**Introduction to Logic Gate and minimization techniques** **Logic Gates:** Basic concepts of Number System, Representation of truth-table, SOP form, POS form, Simplification of logical functions, **Logic Minimization: Minimization** of SOP and POS forms don't care conditions, Reduction techniques: K-Maps up to 4 variables, Quine Mc'Clusky method and realization. **Case Study:** Multi-Password Digital Lock System (with K-Map Minimization) **Self Study:** compare different minimization techniques, Boolean Algebra	9
II	**Design of Combinational Logic** Code converter - BCD, Excess-3, Gray code, Binary Code. Half- Adder, Full Adder, Half Subtractor, Full Subtractor, Multiplexers (MUX), Demultiplexers (DEMUX), Parity generators and checkers. **Case Study:** BCD to 7 segment display controller **Self Study:** Decoder, Encoder, Real-life Applications of MUX	9
III	**Design of Sequential Logic** Storage elements: Latches Flip-Flop: SR, J-K, D, T, Preset & Clear , Truth Tables and Excitation tables, Conversion from one type to another type of Flop- Flop. Registers: SISO, SIPO, PISO, PIPO Counters: Asynchronous Counter, Synchronous Counter, BCD Counter, Johnson and Ring Counter, Modulus of the counter (IC 7490) **Case Study:** Automatic Room Light Controller **Self Study:** Master Slave JK Flip-flop, Race Around condition, Shift Register Applications	9
IV	**Introduction to Computer Organization** Function and Bus structure of computer components, Interconnection structures, Bus Interconnection, Von Neumann model, Harvard Model Fundamental Concepts of Processing Unit, Execution of Complete Instruction I/O interfaces - Serial port, Parallel port, USB bus **Self Study:** Generation of Computers, Signed and Unsigned numbers, 1's and 2's complements, Binary arithmetic.	9
V	**Introduction Memory Systems:** Memory Hierarchy, RAM and its Types, ROM and its Types, Cache Memory, Elements of Cache Design, HDD, SSD, System-on-Chip Processor Organization, Register Organization, Multicore Organization **Self Study**: Comparison of CPU, Introduction to GPU	9
	Total	45
Suggested Lab Assignments:		

1. To verify the functionality of basic logic gates (AND, OR, NOT) and universal logic gates (NAND and NOR) using truth tables.
2. Design and Implement Full adder and Full subtractor using Basic Gates and Universal Gates.
3. Design and Implement Intelligent Code Converter System (Any code (BCD / Binary / Gray)).
4. Design and Realization of Full adder and Full subtractor 8:1 Mux using 4:1 Mux.
5. Design and Implement Parity Generator.
6. Design and Simulate Flip Flop Conversion.
7. Design a 3-bit Up and Down counter using flip-flops.
8. Design and Realization of Mod -N counter using IC 7490.
9. Assembling and disassembling of computer systems and Identifying Internal Components such as motherboard, RAM, SMPS, Ports, I/O Peripherals and Processor etc.

Text Books:

1. R. P. Jain, Kishor Sarawadekar "Modern Digital Electronics", Tata McGraw-Hill, 5th Edition, 2022 ISBN 9789355321770
2. W. Stallings, "Computer Organization & Architecture: Designing for performance", 11th Edition, 2022, Pearson Education/ Prentice Hall of India, ISBN-13: 978-0-13-410161-3.,ISBN 13: 978-1-292-42008-0 (uPDF eBook)

Reference Books:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization and Embedded Systems", 6th Edition, Tata McGraw Hill, 2023.
2. Moris Mano, "Digital Logic and Computer Design", 2023, Pearson, ISBN 978-93-325-4252-5.
3. D. Leach, Malvino, Saha, "Digital Principles and Applications", Tata McGraw Hill, ISBN - 978-9339203405, 8th edition, 21 August 2014.

E-resources:

1. Prof. Goutam Saha - 'Digital Electronics Circuits", IIT Kharagpur https://nptel.ac.in/courses/108105132
2. Prof. Santanu Chattopadhyay 'Digital Circuits", IIT Kharagpur https://nptel.ac.in/courses/108105113
3. Prof. N.J. Rao; 'Digital Systems", IISc Bangalore, https://nptel.ac.in/courses/106108099
4. Digital Circuit Simulator: CircuitVerse - https://circuitverse.org/explore?section=cotw#cotw
5. https://deldsim.com/
6. https://de-iitr.vlabs.ac.in/
7. https://logicdrawer.app/
8. https://truth-table.com/#

Program:	B. Tech. Computer Engineering (Regional Language)					Semester: I	
Course:	Web Development Laboratory					Code: BCER31VS01	
Credits	Teaching Scheme (Hrs. /Week)			Evaluation Scheme and Marks			
	Theory	Practical	Tutorial	TW	OR	PR	Total
2	-	4	-	50	50	-	100

Prior knowledge of Basic Mathematics **is essential.**

Course Objectives: This course aims to enable students,

1. To introduce students to fundamental web development concepts using HTML, CSS, and basic JavaScript.
2. To design interactive and responsive web pages for real-world applications.
3. To utilize modern tools and AI-assisted platforms for web development.
4. To develop small web-based applications integrating frontend concepts.

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

1. Design structured web pages using HTML elements and layouts.
2. Apply CSS for styling and creating responsive user interfaces.
3. Implement basic interactivity using JavaScript.
4. Develop and deploy simple web applications using modern tools and AI assistance.

Guidelines for Students:

1. The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment.
2. Each assignment write-up should have Title, Objectives, Outcomes, Theory- Concept in brief, dataset used, data description, Conclusion, Assessment grade/marks and assessor's sign.
3. Program codes with sample output of all performed assignments are to be submitted as softcopy.
4. All assignments should be done individually.

Guidelines for Laboratory/Term Work Assessment:

1. Continuous assessment of laboratory work is done based on overall performance and Laboratory performance of students.
2. Each Laboratory assignment assessment should assign grade/marks based on parameters with appropriate weightage.
3. Suggested parameters for overall assessment as well as each Laboratory assignment assessment include- timely completion, performance, innovation, efficiency, punctuality and neatness.

Guidelines for Laboratory Conduction

1. Encourage students for appropriate use of Hungarian notation, proper indentation and comments.
2. HTML,CSS concepts will be discussed throughout the lab.

3. Use of open-source software is to be encouraged.
4. Operating System recommended: - 64-bit Open-source Linux.
5. Programming tools recommended: - HTML, CSS

Suggested Lab Assignments

1. Design a personal portfolio page with sections like profile, skills, projects, and contact information.
2. Create a web form to collect user details and display a formatted resume dynamically.
3. Develop a simple webpage to track habits (study, fitness, screen time) with basic input and display.
4. Design a responsive landing page for a product/startup using CSS (Flexbox/Grid).
5. Create a quiz app with multiple questions, score calculation, and result display.
6. Develop a to-do list where users can add, delete, and mark tasks as complete.
7. Fetch and display weather information using a public API.
8. Design a simple chat UI and integrate AI-generated responses (mock or API-based).
9. Mini project

Text Books:

1. Front-End Web Development with Modern HTML, CSS, and JavaScript by John Larsen, Packt Publishing, 2023, ISBN 9781804618172
2. Web Programming with HTML5, CSS, and JavaScript by John Dean, Jones & Bartlett Learning, 2023, ISBN 9781284091793

Reference Books:

1. Professional JavaScript for Web Developers by Matt Frisbie, Wiley, 5th Edition, 2023, ISBN 9781119366447
2. Eloquent JavaScript: A Modern Introduction to Programming by Marijn Haverbeke, No Starch Press, 3rd Edition (updated reprints 2023), ISBN 9781593279509

E-resources:

1. Introduction to Web Development by University of California, Davis, Coursera, Available at: https://www.coursera.org/learn/web-development
2. Responsive Web Design Certification by freeCodeCamp, Available at: https://www.freecodecamp.org/learn/

Program:	B. Tech. Computer Engineering (Regional Language)				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	8

	5. Federalism: Centre–State relations and distribution of powers 6. State Government: role of Governor and State Legislature (overview)	
III	**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)	7
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. Computer Engineering (Regional Language)				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:** Practices listening through IELTS & TOEFL-style audio clip 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. Computer Engineering (Regional Language)					Semester: I	
Course:	Life Skills1					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 Skillsactivities 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 SkillsApplication Project: Present a small group project demonstrating how Life Skillsconcepts 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 Skillsand emotional intelligence.
2. Lifehack (www.lifehack.org): Lifehack shares practical tips, techniques, and advice on personal development, productivity, and Life Skillsimprovement.

Coursera (www.coursera.org): Coursera offers online courses on various Life Skillstopics, often provided by universities and experts, to help individuals develop essential skills

Curriculum

Semester II

Program:	B. Tech. Computer Engineering (Regional Language)						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 it's 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 course https://nptel.ac.in/courses/111107108
2. NPTEL Video for Fourier series http://nptel.iitm.ac.in

Program:	B. Tech. Computer Engineering (Regional Language)					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 functions
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. Computer Engineering (Regional Language)						Semester: II	
Course:	Engineering Chemistry						Code: BSH32BS09	
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 Computers.

Course Objectives: This course aims at enabling students,

1. To provide an overview of key computational chemistry methods and their significance in modern chemical research.
2. To familiarize students with instrumental methods for qualitative and quantitative analysis of water and explore the importance of green chemistry.
3. To build consciousness about the recent development in alternative energy sources and batteries
4. To make student acquainted with chemical and electrochemical mechanism of corrosion and corrosion control
5. To lead students to investigate the advancement in engineering materials

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

1. Apply computational chemistry tools to model molecular structures and properties.
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 visualising 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, Chem Draw, Molview, Gemini, and Claude. **Introduction to Computational Chemistry** **A]Fundamentals of Computational Chemistry:** Definition and scope of computational chemistry, Role in modern chemical research and industry,	10

	Overview of computational workflow (input → calculation → output → interpretation).Tools and Methods in Computational Chemistry: Molecular Mechanics (concept of force fields), Semi-empirical methods (basic idea and applications), Ab initio methods (introductory concept) – basic concept and applications, Comparison of methods (accuracy vs computational cost).Applications: Drug design and discovery, Materials chemistry, Reaction mechanism understanding. **B] Introduction to Chemo informatics:** Definition and importance in chemical data science, Chemical databases: PubChem, ChemSpider (basic navigation and applications), Representation of molecules: SMILES, InChI, Introduction to molecular descriptors and fingerprints.	
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, Structure and properties of Biodegradable Polymers: PHBV, Liquid crystal polymer-Kevlar., E waste management. **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** 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. 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 and its relation. Determination of calorific value - Bomb calorimeter, Boy's calorimeter and numericals. Classification- solid fuels: - Coal. Proximate and ultimate analysis of coal and their significance. Liquid fuels–Crude	9

	petroleum and its refining. Gaseous fuels – Hydrogen as future fuel, Alternative fuels: Power alcohol and biodiesel, their synthesis and 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.	
	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*. McGraw-Hill Education.
7. Dr. Shikha Baskar, (2012). *Engineering Chemistry*. Wiley India Pvt. Ltd.

Reference Books:

1. Cramer, C. J. (2013). *Essentials of Computational Chemistry: Theories and Models* (2nd ed.). John Wiley & Sons.
2. Gowariker, V. R. (2015). *Polymer Science*. New Delhi: New Age International Publishers.
3. Gupta, R. D. (2009). *Hydrogen as a Fuel*. CRC Press.
4. Jensen, F. (2017). *Introduction to Computational Chemistry* (3rd ed.). John Wiley & Sons.
5. Poole, C. P., & Owens, F. J. (2003). *Introduction to Nanotechnology*. John Wiley & Sons.
6. T. Gregory. (1999). *Nanotechnology*. New York: Springer-Verlag.

e-Sources:

1. https://nptel.ac.in/courses/104101002
2. https://www.coursera.org/learn/computational-chemistry

Program:	B. Tech. Computer Engineering (Regional Language)					Semester: II	
Course:	Engineering Chemistry Laboratory					Code:	BSH32BS10
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. Basics of Computer

Course Objectives:

1. To help students procure conceptual clarity in engineering chemistry through laboratory experiments.
2. To develop experimental skills that provide insight into societal and environmental issues.
3. To develop basic understanding of computational chemistry.

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.
3. Construct 2D molecular structures using ChemDraw and Chem 3D tools.

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 Chloride (Cl^-) content in given water sample by Argentometric method.
4	To determine the dissociation constant of a weak acid (acetic acid) using a pH meter.
5	Titration of mixture of strong acid with strong base using Conductivity meter and determine strength of acid.
6	Proximate analysis of Coal.
7	To estimate the amount of Fe (II) present in the given solution potentiometrically.
8	To determine the maximum wavelength of absorption of KMnO4, verify Beer's law and find concentration of the unknown sample.
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	Molecular Modeling usingChemDraw (Chem3D)

References:

1. Mendham, J., Denney, R. C., Barnes, J. D., & Thomas, M. J. K. (2000). *Vogel's Textbook of Qualitative Chemical Analysis* (6th ed.). Pearson Education Ltd.
2. Virmani, O. P., & Narula, A. K. (2009). *Applied Chemistry: Theory and Practice* (2nd ed.). New Age International (P) Ltd.
3. Jensen, F. (2017). *Introduction to Computational Chemistry* (3rd ed.). John Wiley & Sons.

Program:	B. Tech. Computer Engineering (Regional Language)										Semester: II
Course :	Object Oriented Programming										Code : BCER32ES01
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks						
	Lecture	Practical	Tutorial	Other	FA		SA	TW	OR	PR	Total
					FA1	FA2					
3	2	2	-	2	10	10	30	25	-	25	100

Prior knowledge of Fundamental of programming language **is essential.**

Course Objectives: This course aims at enabling students,

1. To introduce the basic concepts of object-oriented programming.
2. To develop understanding of inheritance and polymorphism.
3. To develop skills in handling runtime errors using exception handling techniques.
4. To provide knowledge of file handling for data storage and retrieval.

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

1. Illustrate the core principles of object-oriented programming.
2. Apply inheritance and polymorphism to design flexible and reusable solutions.
3. Use generic programming and exception handling concepts in designing robust solutions.
4. Apply file handling concepts to perform file-based solutions.

Guidelines for Students:

1. Students are expected to work on Assignments/Experiments throughout the semester.
2. Throughout the laboratory process, students must define and analyze the problem, generate learning issues and apply what they have learned to solve the problem.
3. Each student recommended to perform all assignments
4. At the end of each assignment content of OOP is to be applied in the Assignment/ Experiments.
5. Assignments should be implemented.
6. Operating System recommended: - 64-bit Open source Linux
7. Programming tools recommended: - GCC/JAVA/Python

Guidelines for Laboratory/Term Work Assessment:

1. Continuous assessment of laboratory work is done based on overall performance and Laboratory performance of students.
2. Each Laboratory assignment assessment should assign grade/marks based on parameters with appropriate weightage.
3. Suggested parameters for overall assessment as well as each Laboratory assignment assessment include timely completion, performance, innovation, efficiency, punctuality and neatness.

Guidelines for Laboratory Conduction

1. Instructors must regularly monitor and mentor students for successful completion of the Assignments/Experiments throughout the semester as per instructions given in list of assignments..
2. Instructor is expected to form assignments from the set of suggested assignments and Instructor can give single use case (Employee management System, Student management System etc) for the all concepts of OOP Lab assignments .
3. Instructor is expected to complete all assignments
4. Instructor is expected to encourage students for appropriate use of Hungarian notation, proper indentation and comments.
5. Instructors are expected to encourage use of open-source software.

Detailed Syllabus

Unit	Description	Duration [Hrs]
I	**Introduction** Introduction to various programming paradigms: Procedural, object-oriented, logical and functional, Comparison of Procedural and OOP, Features of OOP: class, object, inheritance, polymorphism, abstraction, encapsulation User defined data types, namespaces, typecasting, array of object, Access specifiers, constructors, types of constructor, destructor, inline function, friend function, friend class, static members, references. **Self Study:** this pointer, dynamic memory allocation: new, delete keyword.	7
II	**Inheritance & Polymorphism** Class hierarchy, base and derived class, visibility modes , types of inheritance, Ambiguity in Multiple & hybrid Inheritance, function overriding, virtual base classes **Polymorphism** Static and dynamic binding, Static polymorphism: Function and Operator Overloading, Ambiguity in function overloading, Overloading Using Friend functions, Dynamic polymorphism: Base class pointer, virtual functions, pure virtual functions, abstract classes, and object slicing. **Self Study:** Diamond problem, "using" keyword,Virtual destructor, Inline Functions vs Virtual Functions, Type Casting in Polymorphism	9
III	**Generic Programming & Exception Handling** Introduction to generic programming, Function Template, Class Templates, Template with multiple parameters,STL:Iterators,vector. **Exception Handling** - Fundamentals multiple catching nested try statements uncaught exceptions throw and rethrow Stack unwinding. **Self Study:** List, Deque	7
IV	**File handling** Introduction to stream and file, Classes for File Stream operations, opening and closing files, detecting end of file, Open (): file modes, File pointer and their manipulations, Sequential Input and output file operations, Updating the file: Random access, Error handling during file operations. **Self Study:** Study C++ features used in Mozilla Firefox development	7
	Total	**30**

Suggested Lab Assignments

Unit-1

1. Design a system to calculate total weekly travel cost and determine if a daily pass or regular tickets are more economical.
2. Passengers request seat preferences (window, aisle, lower berth). Design a system to allocate seats based on availability and basic preference matching. If seats are not available, mark the passenger as waitlisted.

Unit-2

3. Vehicles like cars, buses, and trucks pass through a toll booth with different charges. Design a system to calculate toll based on vehicle type and display total collection for the day.
4. Students from different streams (Science, Commerce, Arts) have different subjects. Design a system to calculate total marks and display grades based on stream-specific criteria.

5. Users can make payments using different methods. Design a system where transaction processing varies depending on the selected payment method.

Unit-3

6. Design a system to enter student marks and handle invalid inputs like marks beyond limits or negative values.
7. Design a system to handle failures in a railway booking process, such as payment issues, seat unavailability, and server timeouts. The system should ensure rollback of incomplete transactions, maintain logs, and prevent duplicate bookings

Unit-4

8. A small organization plans to maintain its employee information using a file-based system. Design a program that allows efficient management of employee records with proper file handling and random access, ensuring smooth retrieval and modification of data when required..

Text Books:

1. B. Stroustrup, A Tour of C++, 3rd ed. Addison-Wesley, 2022, ISBN: 978-0136816485.
2. Balagurusamy, E. "Object oriented programming with C++." (2021),McGraw Hill,Edition 8th, ISBN-13 978-9389949186

Reference Books:

1. Deitel, Paul & Deitel, Harvey. C++ How to Program. 11th Edition. Pearson Education, 2025. ISBN-13: 9781292459981.
2. N. M. Josuttis, C++20: The Complete Guide. Addison-Wesley, 2022, ISBN: 978-3967301038.
3. P. Deitel and H. Deitel, C++ How to Program, 11th ed. Pearson Education, 2025, ISBN: 9781292459981.

E-resources:

1. http://www.cplusplus.com (C++ documents, tutorials, and references).
2. Bjarne Stroustrup's C++11 FAQ @ http://www.stroustrup.com/C++11FAQ.html.

NPTEL Course

1. https://onlinecourses.nptel.ac.in/noc21_cs02/preview

Program:	B. Tech. Computer Engineering (Regional Language)						Semester: II	
Course:	Discrete Mathematics						Code: BCER32ES02	
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	2	-	-	2	10	10	30	50

Prior knowledge of Linear Algebra and Univariate Calculus **is essential.**

Course Objectives: This course aims at enabling students,

1. To use appropriate set, function and relation models to understand practical examples, and interpret the associated operations and terminologies in context.
2. To learn logic and proof techniques to expand mathematical maturity.
3. To interpret graph theory and algebraic structure.
4. To formulate problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly.

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

1. Solve problems using appropriate set and logic.
2. Identify various types of relations, functions and their properties.
3. Use the concept of graphs, trees and related discrete mathematics for problem solving.
4. Comprehend the basic results of group and ring theory.

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	**Set Theory and Logic** Significance of Discrete Mathematics in Computer Engineering, Application areas in Computer Engineering. **Set Theory:** Introduction to Set, Set Representation, Set Builder form, roster form, Types of Sets, Set Operations, Multisets, Venn Diagram, Principle of Inclusion and Exclusion, Pigeonhole principle **Logics and Proofs:** Propositions, Conditional Propositions, Truth Tables, Logical Connectivity, Predicates and Quantifiers, Proposition calculus, Mathematical Induction **Self Study:** Translating English Statements into Propositions.	**8**

II	**Relation and Function** **Relation:** Introduction, Properties of Binary Relations, Matrix Representation of Relations, Closure of Relations, Warshall's Algorithm, Equivalence Relations and Equivalence Classes, Partitions, Partial Ordering Relations, Hasse Diagrams and Lattices, Chains and Anti-chains. **Function:** Introduction, Composition of Functions, Injective, Surjective and Bijective Function, Inverse of a Function. **Self Study:** Linear recurrence relation with constant coefficients	**7**
III	**Graph and Trees** **Graph:** Basic Terminology and Special Types of Graphs, Paths and Circuits, Hamiltonian and Euler Paths and Circuits, Isomorphic Graphs, Planar Graph, Dijkstra's Shortest Path Algorithm, **Trees**: Types of trees, Rooted Trees, Prefix Codes, Spanning Trees, Minimum Spanning Trees, Kruskal's and Prim's Algorithm for Minimum Spanning Tree. **Self Study:** Travelling Salesperson Problem, Graph Coloring.	**8**
IV	**Group Theory** Basic Properties of Group, Semigroup & Monoid, Abelian group, Subgroup, Normal subgroup**,** Groups and Coding. Rings, Group Theory, Integral Domain and Field Applications in Coding and Information Security **Self Study:** Hamming code, Congruence and Modulo Relation,	**7**
	Total	**30**

Text Books:

1. Kenneth H. Rosen, ―Discrete Mathematics and its Applications, Tata McGraw-Hill, 9th Edition, 2025, ISBN-13 978-1266191541.
2. C. L. Liu, ―Elements of Discrete Mathematics, TMH, 4th Edition, 2017, ISBN 978-1259006395.

Reference Books:

1. Bernard Kolman, Robert C. Busby, Sharon Cutler Ross, ―Discrete Mathematical Structures, Pearson, 6th Edition, 2025, ISBN-13 978-9332549593.
2. Dr. K. D. Joshi, ―Foundations of Discrete Mathematics‖, New Age International Limited, Publishers, 2nd Edition, January 2014, ISBN-13:978-8122435986.

E-resources:

1. https://nptel.ac.in/courses/106108227
2. https://nptel.ac.in/courses/106106183

Program:	B. Tech. Computer Engineering (Regional Language)					Semester: II	
Course:	Data Exploration and Visualization Laboratory					Code: BCER32PC01	
Credits	Teaching Scheme (Hrs. /Week)			Evaluation Scheme and Marks			
	Theory	Practical	Tutorial	TW	OR	PR	Total
2	-	4	-	50	50	-	100

Prior knowledge of: Linear algebra, Programming Skills is essential

Course Objectives: This course aims at enabling students

1. To introduce students to the fundamentals of data exploration, pre-processing, and visualization using modern tools.
2. To develop the ability to handle real-world datasets and extract meaningful insights.
3. To apply data analysis techniques for solving practical, scenario-based problems.
4. To build skills in presenting data-driven insights using visual and interactive methods.

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

1. Perform data acquisition and cleaning on structured datasets using appropriate tools.
2. Apply data exploration and visualization techniques to represent data effectively.
3. Analyze datasets to identify patterns, relationships, and meaningful insights.
4. Present a data-driven solution for a real-world problem using visualizations.

Guidelines for Students:

1. Laboratory Instructors may design a suitable set of assignments for each topic. All topics should be addressed. For every topic, at least three lab assignments should be framed and approved during the module meeting.
2. For each laboratory assignment, it is essential for students to write the title, aim, topic theory, algorithm, mathematical background, and data set description (as applicable).
3. Laboratory Journal- Program codes with sample output of all performed assignments are to be submitted as softcopy.
4. Term Work –Term work is a continuous assessment that evaluates a student's progress throughout the semester. Laboratory Instructors may design rubrics to assess assignments and mini-projects. Practical Examination should be conducted on a given list of topics.

Suggested Lab Assignments

1. **Dataset Introduction & Basic Exploration**
   Analyze a social media dataset to identify most active users and post frequency.
2. **Data Cleaning and Pre-processing**
   Clean an online shopping dataset by handling missing values and duplicate records.
3. **Data Transformation and Filtering**
   Filter a student dataset to identify top performers based on attendance and marks.
4. **Basic Data Visualization**
   Create charts to show distribution of movie genres in a streaming platform dataset.
5. **Comparative Visualization**
   Compare sales performance across different product categories using visual charts.
6. **Trend Analysis**
   Analyze daily traffic data to identify peak hours and low traffic periods.
7. **Correlation Analysis**
   Examine the relationship between study hours and exam scores using visualization.
8. **Multi-Variable Analysis**
   Analyze fitness dataset to understand relationship between steps, calories, and sleep.
9. **Insight Generation**
   Analyze food delivery dataset to identify factors affecting delivery time.
10. **Mini Project**
    Analyze any real-world dataset to generate insights and present findings using visualizations.

Text Books:

1. Jeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann, Data Visualization: Exploring and Explaining with Data, Second Edition, 2025, Cengage Learning. ISBN 9789366608150.
2. Tom Alby, *Data Science in Practice*, First Edition, 2023, CRC Press. ISBN 9781032505244

Reference Books:

1. Nathan Yau, *Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics*, Second Edition, 2024, Wiley. ISBN 9781119895046
2. Chris Wiggins, Matthew L. Jones, *How Data Happened: A History from the Age of Reason to the Age of Algorithms*, First Edition, 2023, W. W. Norton & Company. ISBN 9781324006732
3. *Effective Data Visualisation for Researchers: Principles and Practice*, First Edition, 2025, Deep Science Publishing. ISBN 9781731234567

E-resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs32/
2. https://www.coursera.org/specializations/introduction-data-science
3. https://www.linkedin.com/learning/topics/data-science
4. https://www.mygreatlearning.com/academy/learn-for-free/courses/basics-of-data-visualization-for-data-science

Program:	B. Tech. Computer Engineering (Regional Language)						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	Harmony in the Human Being: 4. Human being: the Co-existence of the Self and the Body 5. Needs of the Self and the Body 6. The Body as an Instrument of the Self 7. Understanding Harmony in the Self 8. Harmony of the Self with the Body 9. Programme to Ensure Self-Regulation and Health	4

	Sharing Session: 10. Exploring the Difference between Needs of Self and Body 11. Exploring Sources of Imagination in the Self 12. Exploring Harmony of Self with the Body 13. 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: P.L. Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.

1. A. Nagaraj, 1999, JeevanVidya: EkParichaya, JeevanVidyaPrakashan, Amarkantak,
2. A. N. Tripathy, 2003, Human Values, New Age International Publishers.
3. E. G. Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
4. M. Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics and Human Values, Eastern Economy Edition, Prentice Hall of India Ltd.
5. B. P. Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
6. 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. Computer Engineering (Regional Language)					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:
1. To apply professional branding principles to technical career documentation and digital profiles
2. To 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

- "Learn English: Careers." *British Council*, 2026,https://learnenglish.britishcouncil.org/careers.
- "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. Computer Engineering (Regional Language)						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. Computer Engineering (Regional Language)				Semester	I
Course:	Japanese				Code:	BSH31AE04
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. Computer Engineering (Regional Language)					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. Computer Engineering (Regional Language)						Semester: II	
Course:	Indian Knowledge System (IKS)						Code:	BSH32IK02
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 ShadDarshanas 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. Computer Engineering (Regional Language)					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 SkillsI.

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 Skillss, 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 Skillsto 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 Skillstopics, 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 Skillsdevelopment

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 Computer Engineering (Regional Language) Department

Department Vision

To be a pioneering computer engineering program in the regional language, by developing ethical professionals ready for academia, research, industry, entrepreneurship, while preserving culture through technology.

Department Mission

M1: To educate students on cutting-edge technologies, fostering problem-solving capabilities, and teamwork skills through a contemporary curriculum, without language barriers.

M2: To foster innovative thinking and collaborative research through state-of-the art computing environment.

M3: To Develop professionals with strong ethical values and a deep understanding of cultural contexts to make a positive impact on society.