Pimpri Chinchwad Education Trust's

PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE 411044

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

Curriculum Structure and Syllabus
of
First Year B. Tech. Computer Science and Engineering (AI & ML) (Regulations 2023)

Effective from Academic Year 2025-26

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, 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 CSE (AI & ML)

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS chairman
1	Discrete Mathematics	BCS21ES01	17	Chairman, Board of Studies Computer Science & Engineering (AI & ML) PCET's Pimpri Chinchwad College of Engineering Sector 26, Pradhikaran, Nigdi, Pune - 411044.
2	Computer Organization & Operating Systems	BCS21ES02	19	
3	Computer Organization & Operating Systems Lab	BCS21ES03	21	
4	C Programming	BCS21VS01	23	
5	Data Science	BCS22ES04	36	
6	Data Science Laboratory	BCS22ES05	38	
7	Software Engineering	BCS22PC01	41	
8	Object Oriented Programming using C++	BCS22VS02	43	

Board of Studies – Applied Science and Humanities

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS chairman
1	Linear Algebra &Univariate Calculus	BSH21BS01	11	Chairman BoS, Applied Sciences & Humanities PCET's, Pimpri Chinchwad College of Engineering Sector No. 26, Pradhikaran, Nigdi, Pune-44
2	Linear Algebra &Univariate Calculus Laboratory	BSH21BS02	12	
3	Engineering Physics	BSH21BS03	13	
4	Engineering Physics Laboratory	BSH21BS04	15	
5	Indian Knowledge System	BSH21IK01	25	
6	Life Skill I	BSH21CC01	27	
7	Multivariate Calculus	BSH22BS07	30	
8	Multivariate Calculus Laboratory	BSH22BS08	31	
9	Engineering Chemistry	BSH22BS05	32	
10	Engineering Chemistry Laboratory	BSH22BS06	34	
11	AEC (Eng/Ger/Jap /Business story telling)	BSH22AE01/ 02/03/04	46/48/51 /53	
12	Life Skill II	BSH22CC02	56	

Approved by Academic Council:
Chairman, Academic Council
Pimpri Chinchwad College of Engineering

Chairman
Academic Council
PCET's, Pimpri Chinchwad College of Engineering
Sector No. 26, Pradhikaran, Nigdi, Pune-44

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CURRICULUM FRAMEWORK
(2023 Regulations)

LIST OF ABBREVIATIONS

Sr. No.	Abbreviation	Type of Course
1	BSC	Basic Science Course
2	ESC	Engineering Science Course
3	PCC	Program Core Course
4	PEC	Program 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	CC/LLC	Co-curricular courses / Liberal Learning Courses

COURSE WISE CREDIT DISTRIBUTION

Sr. No.	Type of Course	No. of Courses	Total Credits	
			No.	%
1	Basic Science Course	8	14	35
2	Engineering Science Course	5	12	30
3	Programme Core Course	1	2	5
4	Vocational and Skill Enhancement Course	2	4	10
5	Ability Enhancement Course	1	2	5
6	Indian Knowledge System	1	2	5
7	Co-Curricular Courses	2	4	10
	Total	**20**	**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	3	2							5
3.	Programme Core Course	-	1							1
4.	Vocational and Skill Enhancement Course	1	1							2
5.	Ability Enhancement Course	-	1							1
6.	Indian Knowledge System	1	-							1
7.	Co-Curricular Courses	1	1							2
Total		**10**	**10**							**20**

SEMESTER-WISE CREDIT DISTRIBUTION

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

Curriculum Structure

Semester I & II

CURRICULUM STRUCTURE
First Year B. Tech. CSE (AI&ML) Semester – I

First Year B. Tech Computer Engineering (Regulations 2023) (With effect from Academic Year 2025-26)																	
Semester I																	
Course Code	**Course Name**	**Credit Scheme**				**Teaching Scheme (Hours/Week)**					**Evaluation Scheme and Marks**						
											FA		**SA**	**TW**	**PR**	**OR**	**Total**
		L	**P**	**T**	**Total**	**L**	**P**	**T**	**O**	**Total**	**FA1**	**FA2**					
BSH21BS01	Linear Algebra &Univariate Calculus	2	-	-	2	2	-	-	1	3	10	10	30	-	-	-	50
BSH21BS02	Linear Algebra &Univariate Calculus Laboratory	-	1	-	1	-	2	-	-	2	-	-	-	25	25	-	50
BSH21BS03	Engineering Physics	2	-	-	2	2	-	-	1	3	10	10	30	-	-	-	50
BSH21BS04	Engineering Physics Laboratory	-	2	-	2	-	4	-	-	4				50	50	-	100
BCS21ES01	Discrete Mathematics	3	-	-	3	3	-	-	1	4	20	20	60	-	-	-	100
BCS21ES02	Computer Organization & Operating Systems	3	-	-	3	3	-	-	1	4	20	20	60	-	-	-	100
BCS21ES03	Computer Organization & Operating Systems Laboratory	-	1	-	1	-	2	-	-	**2**	-	-	-	50	-	-	50
BCS21VS01	C Programming	-	2	-	2	-	4	-	-	4	-	-	-	50	-	50	100
BSH21IK01	Indian Knowledge System	2	-	-	2	2	-	-	-	2	25	25	-	-	-		50
BSH21CC01	Life Skill I	-	2	-	2	-	4	-		**4**			-	100	-	-	100
	Total	**12**	**8**	**-**	**20**	**12**	**16**	**-**	**4**	**32**	**85**	**85**	**180**	**275**	**75**	**50**	**750**

L-Lecture, **P**-Practical, **T**-Tutorial, **O**-Other, **FA**–Formative Assessment, **SA**-Summative Assessment, **TW**-Term Work, **OR**-Oral, **PR**-Practical

CURRICULUM STRUCTURE

First Year B. Tech. CSE (AI & ML) Semester – II

First Year B. Tech Computer Engineering (Regulations 2023)
(With effect from Academic Year 2025-26)

Semester II

Course Code	Course Name	Credit Scheme				Teaching Scheme (Hours/Week)					Evaluation Scheme and Marks						
		L	P	T	Total	L	P	T	O	Total	FA		SA	TW	PR	OR	Total
											FA1	FA2					
BSH22BS07	Multivariate Calculus	2	-	-	2	2	-	-	1	3	10	10	30	-	-	-	50
BSH22BS08	Multivariate Calculus Laboratory	-	1	-	1	-	2	-	-	2	-	-	-	25	25	-	50
BSH22BS05	Engineering Chemistry	2	-	-	2	2	-	-	1	3	10	10	30	-	-	-	50
BSH22BS06	Engineering Chemistry Laboratory	--	2	-	2	-	4	-	-	4	-	-	-	50	50	-	100
BCS22ES04	Data Science	3	-	-	3	3	-	-	1	4	20	20	60	-	-	-	100
BCS22ES05	Data Science Laboratory	-	2	-	2	-	4	-	-	4	-	-	-	50	50	-	100
BCS22PC01	Software Engineering	2	-	-	2	2	-	-	1	3	10	10	30	-	-	-	50
BCS22VS02	Object Oriented Programming using C++	-	2	-	2	-	4	-	-	4	-	-	-	50	-	50	100
BSH22AE01 /02 /03 /04	AEC (Eng/Ger/ Jap/Business story telling)	1	1	-	2	1	2	-	-	3	10	10	30	-	-	-	50
BSH22CC02	Life Skill II	-	2	-	2	-	4	-	-	4	-	-	-	100	-	-	100
Total		**10**	**10**	**0**	**20**	**10**	**20**	**0**	**4**	**34**	**60**	**60**	**180**	**275**	**125**	**50**	**750**

L-Lecture, **P**-Practical, **T**-Tutorial, **O**-Other, **FA**–Formative Assessment, **SA**-Summative Assessment, **TW**-Term Work, **OR**-Oral, **PR**-Practical

Course Syllabus

Semester I

Program:	B. Tech. CSE (AI & ML)				Semester: I			
Course:	Linear Algebra & Univariate Calculus				Code:	BSH21BS01		
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	2	-	-	1	20		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 for the solution of the system of equations, linear dependence/independence of vectors and finding Eigen values and Eigen vectors.
2. Evaluate the problems of indeterminate forms, Taylor's and Maclaurin's expansions using successive differentiation
3. Formulate the mathematical models related to orthogonal trajectories, electrical circuits and one- dimensional heat flow and solve using ordinary differential equations.
4. Solve higher-order linear differential equations andApply it to evaluate the current for electrical circuits.

Detailed Syllabus

Unit	Description	Duration [Hrs]
I	Matrices: Rank, System of linear equations with applications in electrical circuits, Linear dependence and independence, Linear transformations, Eigen values, Eigen vectors.	8
II	Differential Calculus: Indeterminate Forms, Taylor's series, Maclaurin's series, Successive differentiation and Leibnitz theorem.	7
III	Ordinary Differential Equations: Exact differential equations, Differential equations reducible to Exact form. Applications: Orthogonal trajectories, Kirchoff's law of electrical circuits (L-R and R-C circuits), 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, 4e, 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:
NPTEL Course lectures links
1. https://www.youtube.com/watch?v=4QFsiXfgbzM&list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpI5

Program:	B.Tech. CSE (AI & ML)					Semester: I	
Course	Linear Algebra & Univariate Calculus Laboratory					Code:	BSH21BS02
Credits	Teaching Scheme (Hrs. /Week)			Evaluation Scheme and Marks			
	Theory	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	25	-	25	50

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

Course Objectives: This course aims to enable students,
1. To equip with the ability to apply MATLAB for solving engineering problems involving matrices, ordinary differential equations, and differential calculus.
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 MATLAB programs to solve problems related to matrices, differential calculus, and ordinary differential equations.
2. Prepare a well-structured technical Mini Project report and deliver an effective presentation with clarity and comprehensive understanding of the topic

Detailed Syllabus

Expt. No.	List of Experiments using MATLAB
1	Introduction to MATLAB and basic commands
2	Conversion of matrices into systems of linear equations
3	Conversion and solution of systems of linear equations into matrix form
4	Linearly dependent/independent vectors, eigenvalues, and eigenvectors
5	Evaluation of Indeterminate Forms,
6	Expanding functions by using Taylor's and Maclaurin's Theorems
7	Successive Differentiation
8	Solution of Exact & Non-Exact Differential Equations
9	Solve higher-order linear differential equations
10	Apply the method of linear differential equations to determine the current or charge in the given electrical circuit
11	Apply the method of linear differential equations to determine the temperature distribution using the principles of heat conduction (Fourier's Law of Heat Conduction)
12	Mini Project* (14 hrs.)

***Mini Project Guidelines:**
Students must prepare a mini-project based on topics such as matrices, ordinary differential equations, differential calculus, or other relevant mathematical concepts.

General Guidelines:
1. The project group shall 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. Introduction to MATLAB for Engineers and Scientists by Sandeep Nagar, Springer.
2. INTRODUCTION TO MATLAB FOR ENGINEERING STUDENTS by David Houcque, version 1.2, Northwestern University.
3. An Introduction to Differential Equations using MATLAB by Rizwan Butt, Alpha Science International Ltd.

Program:	B. Tech. CSE (AI & ML)						Semester: I	
Course:	Engineering Physics						Code:	BSH21BS03
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	2	-	-	1	10	10	30	50

Prior knowledge of:

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

Course Objectives: This course aims at enabling students,

1. To build strong conceptual understanding of Semiconductor Physics and Quantum Physics.
2. To explore advances in Physics with introduction of Nanotechnology and Superconductivity.
3. To provide consciousness about the importance of Physics principles in various engineering applications.

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

1. Apply basics of semiconductor physics to explain the behaviour of charge carriers inside a semiconductor.
2. Distinguish wave behaviour of a matter particle for the manipulation of the processes at quantum scale.
3. Apply the fundamental principles of quantum physics to understand the basic concepts of quantum computing and superconductivity.
4. Summarize properties, preparation methods of nanomaterials and explore their applications in various engineering fields.

Detailed Syllabus

Unit	Description	Duration [Hrs]
I	**Semiconductor Physics** Formation of bands in solids, electrical conductivity of conductors (qualitative) and semiconductors (intrinsic and extrinsic with derivation). Hall effect (with derivation) and its applications, Fermi level in metal and semiconductors, Fermi Dirac probability distribution function (at T=0K and T>0K), position of Fermi level (intrinsic and extrinsic), variation of Fermi level with temperature and doping concentration. Working of PN junction diode on the basis of energy band diagram, Solar cell (principle, working, IV characteristics).	7
II	**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, normalisation 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). Tunnelling effect.	8
III	**Introduction to Quantum Computing and Superconductivity:** **Quantum Computing:** Classical to Quantum (Bits vs Qubits), limitations of classical computers, advantages of quantum computing. Superposition, entanglement, quantum interference, measurement in quantum systems, Qubits (definition and	8

	physical realization of qubits, representation using Dirac notation (|0⟩, |1⟩), quantum gates (Pauli-X, Hadamard, CNOT, SWAP), quantum circuits, comparison with classical logic gates. Applications of quantum computing. **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, AC and DC Josephson effect, DC-SQUID-construction, working and applications, applications of superconductivity- superconducting magnets, maglev trains.	
IV	**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, defence.	7
	Total	**30**

Text Books:

1. A textbook of Engineering Physics-Dr. M.N. Avadhanulu, Dr. P.G. Kshirsagar- Revised edition 2024, S. Chand & Company Pvt. Ltd.
2. Engineering Physics-R.K. Gaur, S. L Gupta, -Eighth revised edition 2012, Dhanpatrai Publications (P) Ltd.
3. Nanotechnology -Principles & Practices - Sulabha K. Kulkarni -Third edition -Capital Publishing Company.
4. Quantum Computation and Quantum Information by Nielsen and Chuang, Cambridge University Press.

Reference Books:

1. Introduction to Quantum Mechanics. - David J. Griffiths, Darrell F. Schroeter, Third edition, Cambridge University Press.
2. Introduction to Solid States Physics - Charles Kittel, Eighth Edition, Wiley India Pvt Ltd.
3. Nano: The Essentials. -T. Pradeep, First edition 2007, McGraw Hill Education. Heat and Thermodynamics, Anandamoy Manna, Pearson Publishers 2011.

e-sources:

1. NPTEL Semiconductor Devices and Circuits

Instructor: Prof. Neeraj Khare, IIT Delhi Link: https://nptel.ac.in/courses/117102062

Instructor: Prof. Shashank Tripathi, IIT Kanpur Link: https://nptel.ac.in/courses/115104112.

2. NPTEL Course: Quantum Physics

Instructor: Prof. D. K. Ghosh, IIT Bombay Link: https://nptel.ac.in/courses/115101107

Instructor: Prof. V. Balakrishnan, IIT Madras Link: https://nptel.ac.in/courses/122106034

3. NPTEL Course: Introduction to quantum computing

Instructor: Prof. Prabha Mandayam: Associate Professor at IIT Madras, Link: https://nptel.ac.in/courses/106106232

4. NPTEL Course: Superconductivity

Instructor: Prof. P. S. Anil Kumar, IISc Bangalore Link: https://nptel.ac.in/courses/115108078

Instructor: Prof. Arghya Taraphder, IIT Kharagpur Link: https://archive.nptel.ac.in/courses/115/105/115105131/

5. NPTEL Course: Introduction to Nanoscience and Technology

Instructor: Prof. V. Ramgopal Rao, IIT Bombay Link: https://nptel.ac.in/courses/118102003

Instructor: Prof. M. K. Radhakrishnan Link: https://nptel.ac.in/courses/117108047

Program:	B.Tech.CSE (AI&ML)					Semester: I	
Course:	Engineering Physics Laboratory					Code: BSH21BS04	
Credits	Teaching Scheme (Hrs. /Week)			Evaluation Scheme and Marks			
	Theory	Practical	Tutorial	TW	OR	PR	Total
2	-	4	-	50	-	50	100

Course Objectives:

1. To provide better understanding of concepts, principles of Physics by giving hands on experience.
2. To develop an insight in scientific experimental methodologies.

Course Outcomes:

1. To demonstrate concepts of optics by performing experiments using optical instruments.
2. To analyse experimental data, understand the significance of results and draw conclusions about semiconductor material properties and device performance.
3. To conduct experiments related to magnetism and sound; interpret result within the framework of physical theories.
4. To apply core concepts from engineering physics, such as mechanics, electricity and magnetism, optics, or materials science for a focused mini project.

Detailed Syllabus

Expt. No.	Title of Experiments
	Group A
1	Newton's Rings (To demonstrate the phenomenon of interference of light in wedge shaped film)
2	Newton's Rings (To determine the radius of curvature of Plano-convex lens)
3	Diffraction Grating (To determine the wavelength of different colours)
4	Diffraction Grating (To determine the wavelength of monochromatic source of light)
5	Malus Law (To verify the Malus Law of polarization of light)
6	Double Refraction: Birefringence (To determine refractive indices and type of crystal)
7	LASER (To determine the size of grating element using LASER)
8	Ultrasonic Interferometer (To determine the compressibility of given liquid)
9	Solar Cell (To determine Fill Factor using IV characteristics)
10	Energy Band Gap (To determine band gap of given semiconductor)
11	Four Probe Method (To determine the resistivity of a given sample)
12	Four Probe Method (To determine the energy band gap of a given sample)
	Group B
1	Hall effect (To demonstrate the Hall effect in semiconductors)
2	Hall effect (To determine the Hall coefficient, mobility and charge carrier in a given semiconductor)
3	Quincke's method (To determine the magnetic susceptibility of MnSO4.H2O solution)
4	Quincke's method (To determine the magnetic susceptibility of FeCl3 solution)
5	Sound Absorption Coefficient (To determine the sound absorption coefficient of the given materials)
6	Optic Fibre Cable (To determine the numerical aperture and acceptance angle)
7	Solar Cell (To determine Fill Factor using IV characteristics for series and parallel combination)

8	Industry-Driven or Faculty-Initiated Experiment
9	Mini project

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. Sensors Handbook- Sabrie Soloman, Second edition, Mc Grew Hill Publications,
4. Fundamentals of Physics- Resnick & Halliday (John Wiley &sons)
5. An introduction to Laser' s theory and applications, Dr. M. N. Avdhanulu, Dr. P.S. Hemne, S. Chand & Co. Pvt. Ltd.
6. Introduction to solid states Physics - Charles Kittel, Eighth Edition, Wiley India Pvt Ltd.

Program:	B. Tech. CSE (AI & ML)				Semester: I			
Course:	Discrete Mathematics				Code:	BCS21ES01		
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 Linear Algebra and Univariate Calculus **is essential.**

Course Objectives:

1. To learn the mathematical formulation of problems by using set, function and relations.
2. To learn logic and proof techniques to reason the solutions mathematically.
3. To interpret set theory, graph theory, and algebraic structures.
4. To learn the formal proof techniques in the formulation of problems.
5. To learn probability theory and various distributions.

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

1. Use fundamental discrete structures and perform various set operations.
2. Solve the problems logically using discrete objects like functions and relations.
3. Use propositional logic to formulate the problems mathematically.
4. Use graph and tree techniques in problem-solving.
5. Identify and apply the basic techniques of counting.
6. Apply probability theory and by analyzing the various types of probability distributions.

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	**Mathematical Reasoning and Set theory** **Fundamentals of logic:** Propositions, Truth Tables, Logical Connectivity, Propositional logic and its applications **Set Theory:** Introduction, Set Representation, Types of Sets, Set Operations, Laws of set theory, Introduction to Structured sets: Groups and Rings. **Mathematical Induction:** Introduction, proof technique, Case Study on Verification for the correctness of computer program using principle of mathematical induction	8
II	**Relations and Functions:** **Relation:** Relation Definition, Properties of Binary 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:** Function Definition, Composition of Functions, Injective, Surjective and Bijective Function, Inverse of a Function	7
III	**Graphs and Trees:** **Graph theory:** Basic Terminology, Types of Graphs, Paths and Circuits, Hamiltonian and Euler Paths and Circuits, Isomorphic Graphs, Planar Graph, Dijkstra's Shortest Path Algorithm. **Trees**: Trees, Rooted Trees, Prefix Codes, Huffman Algorithm for Optimal Tree, Spanning Trees, Minimum Spanning Trees, Kruskal's and Prim's Algorithm.	8
IV	**Counting:** Introduction, Basic counting principles, principle of inclusion and exclusion, pigeonhole principle, permutations, combinations, permutations and	7

	combinations with repetitions, binomial theorem.	
V	**Probability:** The axioms of probability, discrete probability, Random variables, discrete random variable, conditional probability, independent events, Bayes' rule, Bernoulli trials, probability mass function, continuous random variable, probability density function.	7
VI	**Probability Distribution** - Cumulative distribution function, properties of cumulative distribution function. Two-dimensional random variables and their distribution functions, Marginal probability function, Independent random variables. Probability distributions: Gaussian distribution, Binomial Distribution, Poisson poisson distribution.	8
	Total	**45**

Textbooks:

1. C. L. Liu, "Elements of Discrete Mathematics", Tata McGraw-Hill, 4th Edition, 2017, ISBN 978-1259006395.
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw-Hill, 8th Edition, 2018, ISBN 978- 1259676512

Reference Books:

1. Dr. K. D. Joshi, "Foundations of Discrete Mathematics", New Age International Limited Publishers, 2nd Edition, January 2014, ISBN-13: 978-8122435986
2. Nicholas N.N., Nsowah-Nuamah, "Introduction to Probability Theory" Universal Book Stall.

e sources

1. NPTEL Course https://onlinecourses.nptel.ac.in/noc20_cs82/preview
2. NPTEL Course -https://nptel.ac.in/courses/106108227

Program:	B. Tech. CSE (AI&ML)				Semester: I			
Course:	Computer Organization and Operating Systems				Code:	BCS21ES02		
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: Computer fundamentals are essential.

Course Objectives:

1. To get acquainted with the basic concept of computer organization & operating systems.
2. To learn and understand data structures used in the design of operating systems.
3. To understand the functions of operating systems.
4. To learn process management and inter-process communication
5. To learn memory management and I/O management.

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

1. Describe the basic concepts of computer organization.
2. Demonstrate the organizational structure of the central processing unit.
3. Comprehend the concepts of I/O subsystems.
4. Comprehend the internal components of operating systems.
5. Illustrate the concept of process synchronization.
6. Compare various CPU scheduling; disk scheduling, and page replacement policies.

Detailed Syllabus:

Unit	Description	Duration [Hrs]
I	Basic Functional Units of Computers: Functional units, basic operational concepts, Bus structures, ALU and Control unit. Data Representation: Signed number representation, fixed and floating-point Representations, addition and subtraction of signed numbers, signed operand multiplication, booth & algorithm.	7
II	Central Processing Unit Organization: Introduction, General Register Organization, Instruction formats, Addressing modes, CISC and RISC, Data path in a CPU, Instruction cycle.	7
III	Input/output subsystem: I/O peripherals - Input devices, output devices, I/O ports, Serial port, Parallel port, PCI bus, Secondary storage devices. Memory Subsystem: Memory hierarchy, Cache memory.	8
IV	Introduction to OS: Operating system functions, Different types of O.S Process Management: Process states, Process control block, threads, and system calls. Scheduling algorithms: FCFS,SJF, RR, and Priority Scheduling Algorithm.	8
V	Process Synchronization: Introduction, Need, Inter Process Communication, producer-consumer problem, Deadlock: Introduction, Deadlock Prevention, and Deadlock Avoidance.	7
VI	Memory Management: Introduction, Memory Allocation Strategies, Swapping, Paging, Segmentation, Virtual Memory, Page Replacement, Disk management: Introduction, disk scheduling policies: FIFO, SSTF, SCAN.	8
	Total	**45**

Text Books:

1. W. Stallings, “Computer Organization & Architecture: Designing for performance”, Pearson Education/ Prentice Hall of India, 10th Edition, 2016, ISBN-10: 0-13-410161-8 | ISBN-13: 978-0-13-410161-3.

2. Silberschatz A., Galvin P., Gagne G., “Operating System Concepts”, John Wiley and Sons, 9th Edition, 978-1-118-06333-0.

Reference Books:

1. Achyut S. Godbole , Atul Kahate; “Operating Systems, McGraw Hil, 3rd Edition, ISBN-10: 0-07-059113-X| ISBN-07-059113-4.
2. Dhamdhere D., Systems Programming and Operating Systems, McGraw Hill, ISBN: 0-07-463579-4.
3. Stallings W., Operating Systems, 6th Edition, Prentice Hall, ISBN: 978-81-317-2528-3.
4. Andrew S. Tanenbaum,, Modern Operating Systems”, Prentice Hall of India Publication; 3rd Edition. ISBN: 978-81- 203-3904-0.

e-sources:

1. https://pdos.csail.mit.edu/6.828/2018/xv6/book-rev11.pdf

Program:	B. Tech. CSE (AI & ML)					Semester: I	
Course:	Computer Organization & Operating System Lab					Code:	BCS21ES03
Credits	Teaching Scheme (Hrs. /Week)			Evaluation Scheme and Marks			
	Theory	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	50	-	-	50

Prior knowledge of: A basic computer is essential.

Course Objectives:

1. To comprehend the basic functional units & input-output system of computer organization.
2. To learn the implementation of process management and its scheduling.
3. To understand the concepts and implementation of memory management policies.
4. To analyze and apply various page replacement policies used for paging.

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

1. Comprehend functional units and input-output systems of CPU organization.
2. Demonstrate basic Linux commands & system calls to be used for Shell programming.
3. Implement the various process management policies of CPU scheduling
4. Demonstrate the concept of memory management and its allocation policies.
5. Develop page replacement policies used for paging.
6. Implement intercrosses communication by simulating suitable approaches of process synchronization

Guidelines for Students:

The laboratory assignments should be submitted by students in the form of a journal.

Each assignment write-up should have a title, objectives, outcomes, Theory- Concept in brief, data description, conclusion, and assessor's signature.

Program codes with sample output of all performed assignments should be submitted.

Guidelines for Laboratory / Term Work Assessment:

Continuous assessment of laboratory work is done based on the overall performance and laboratory performance of the students.

Each laboratory assignment assessment should assign grade/marks based on parameters with appropriate weightage.

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:

The suggested list of assignments is given below. Instructors can frame suitable assignments.

Perform any 8 assignments from Group A and Group B. Instructors make sure that all topics get covered.

Suggested List of Assignments

GROUP A - Assignments based on Computer Organization & Basics of Operating System

1	To study peripherals of a computer and its functions. To study and comprehend the CPU organization & input- output systems of computers.

2	To write a C program for the given problem statements to showcase the conversion between various number systems. • Decimal to Binary and Binary to Decimal • Decimal to Octal and Octal to Decimal • Binary to Hexadecimal and Hexadecimal to Binary
3	To study various system calls & demonstrate those with Linux commands: ls, cat, man, cd, touch, cp, mv, rmdir, mkdir, rm, chmod, pwd.
4	Write a Shell program for the given problem statements: • To find the factorial of a number. • To check if the given year is leap year or not • To check if the given number is even or odd.
5	To study and demonstrate the File / directory related system calls / library functions (read, write, open, close, lseek, opendir, readdir, closedir etc.)
GROUP B - Assignments based on Operating System	
6	To write a C program for implementation of any one scheduling algorithms - FCFS, SJF, Priority, Round Robin).
7	To write a C program to implement the Inter – Process Communication (IPC) technique.
8	To Write a C program to implement any memory allocation technique.
9	To write a C program for the implementation of the FIFO or LRU page replacement algorithm.
10	To write a C program for implementation of FIFO or SSTF disk scheduling algorithms.

Text Books:

1. W. Stallings ,"Computer Organization & Architecture: Designing for Performance,", 10th Edition, 2016, Pearson Education/ Prentice Hall of India, ISBN-10: 0-13-410161-8 | ISBN-13: 978-0-13-410161-3
2. Silberschatz A., Galvin P., Gagne G.; "Operating System Concepts", 9th Edition, John Wiley and Sons.

Reference Books:

1. Dhamdhere D., "Systems Programming and Operating Systems", McGraw Hill, ISBN 0 -07 - 463579 – 4
2. Achyut S. Godbole , Atul Kahate; "Operating Systems", 3rd Edition, McGraw Hill 2
3. Stallings W., "Operating Systems", 6th Edition, Prentice Hall, ISBN-978-81-317-2528-3.
4. Andrew S. Tanenbaum; Modern Operating Systems; Prentice Hall of India Publication; 3rd Edition. ISBN: 978-81-203- 3904-0

Web References

https://pdos.csail.mit.edu/6.828/2018/xv6/book-rev11.pdf
https://nptel.ac.in/courses/106106144

Program:	B. Tech. CSE (AI & ML)					Semester: I	
Course:	C Programming					Code:	BCS21VS01
Credits	Teaching Scheme (Hrs. /Week)			Evaluation Scheme and Marks			
	Theory	Practical	Tutorial	TW	OR	PR	Total
2	-	4	-	50	50	-	100

Prior knowledge:
Mathematics and computers are essential.

Course Objectives:
1. To get acquainted with basics of C programming, such as data types, variables, and operators.
2. To learn decision controls and iterations using C programming constructs.
3. To impart the concepts like arrays, strings, pointers, functions, user defined data types and file handling.
4. To develop a simple application using the C language.

Course Outcomes: After learning the course, the students will be able to:
1. Develop a C program using basic elements like data types, variables and operators.
2. Write the conditional blocks and loops in C programs using suitable constructs.
3. Use C programming elements such as array, string, pointers, functions, user defined data types and file handling libraries.
4. Develop an application based on real life examples using" C" construct.

Guidelines for Students:
1. The laboratory assignments are to be submitted by students in the form of a journal.
2. Each assignment write-up should have a title, objectives, outcomes, Theory- Concept in brief, dataset used, data description, conclusion, and assessor's signature.
3. Program codes with sample output of all performed assignments should be submitted.

Guidelines for Laboratory / Term Work Assessment:
1. Continuous assessment of laboratory work is done based on the overall performance and laboratory performance of the 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. The suggested list of assignments is given below. Instructors can frame suitable assignments.
2. All assignments are mandatory.
3. In addition to these, instructors are supposed to assign one real life application in the form of a mini-project based on the concepts learned.

Detailed Syllabus

Expt. No.	Suggested List of Experiments
1	Write a C program that uses relational operators to compare the temperatures of two cities to determine which one is hotter, colder, or if they have the same temperature.
2	Consider you have created a website in which you are accepting details of users where you have to take password from the user. Write a C program to accept password from user with following condition: 1. Minimum characters 6 and maximum are 12. 2. At least one digit and one character. At least one special symbol (@, $, #).
3	Write a C program to 1. Check if the given number is even or odd. 2. Check if the given number is prime or not.

	3. Check if the given number is palindrome or not. 4. Print fibonacci series up to n.
4	Write a C program using a while loop to simulate a dice rolling game. In this game, the player rolls a six-sided dice and accumulates points based on the roll until they choose to stop or roll a 1. The goal is to score as many points as possible without rolling a 1.
5	Write a C program to generate a simple calculator that demonstrates the use of decision control structures: switch statement.
6	Write a C program to manage a student's grades using an array. In this program, allow the user to enter the grades of five subjects for a student and then calculate the average grade.
7	Write a C program to find the length of a string, concatenate two strings, copy string using string library functions.
8	Write a C program to swap the values of two variables using pointers. In this scenario, imagine you are a teacher, and you want to swap the positions of two students in a class. You have the student Names and their seat numbers stored in variables, and you want to swap their seats.
9	Write a C program using functions to simulate a simple banking system. Implement functions for depositing, withdrawing, and checking the account balance.
10	Write a C program that uses a structure to model a real-life example of a book record system. Define a structure to represent a book with attributes like title, author, and year of publication. Perform operations like adding a new book, displaying book details, and searching for a book by title.
11	Write a C program to perform file operations like create, open, read, write and close a file.
12	Design a mini project to implement Game, Smart Text editor or various real time applications integrating C programming concepts.

References:

1. Herbert Schildt, “C: The Complete Reference”, McGraw Hill, 4th Edition, 2000, ISBN-13: 978-0072121247.
2. Maureen Sprankle, “Problem solving and programming concepts”, Pearson,7th Edition, 2011, ISBN-13: 978-0132492645.
3. R. G. Dromey, “How to Solve it by Computer”, Prentice-Hall International,1 st Edition, 1982, ISBN -13: 978-0134340012.

Program:	B. Tech. CSE (AI & ML)						Semester: I	
Course:	Indian Knowledge System (IKS)						Code:	BSH21IK01
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

1. Course Objectives: This course aims at enabling students,
2. To familiarize with the concepts of Indian Knowledge System
3. 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** • Origins and Evolution: Vedic, Post-Vedic, Classical, and Medieval contributions to IKS • Introduction to Vedas and *Shat*Darshanas as foundational sources of Indian philosophy • Transmission of Knowledge: Oral tradition, Shruti-Smriti, Guru-Shishya Parampara andEarly Texts • Institutional Framework: Ancient Indian universities (Takshashila, Nalanda, Vikramshila, Vallabhi) • Revival: Modern relevance, and efforts towards restoration	7
II	**Unit 2: Scientific and Technological Contributions of IKS** • Contributions to Mathematics (Baudhayana, Aryabhata, Brahmagupta & Bhaskaracharya -II **)** • Astronomy and Cosmology (Surya Siddhanta, Jyotish Shastra, Astronomical Observatories) • Metallurgy, Material Science, and Engineering (Iron Pillar, Wootz Steel, Zinc Distillation) • Civil Engineering and Architecture (Vastu Shastra, Water Management Systems, Temple and City Planning) • Ayurveda and Traditional Healthcare Systems	8
III	**Unit 3: Literary, Performing and Artistic Traditions and festivals of India** • Contributions of Indian Literature to Ethics and Leadership (Ramayana, Mahabharata) • Folk Traditions and Oral Narratives: Preserving local culture and wisdom • Performing Arts and Knowledge Expression (Natya Shastra, Temple Art, Music and Dance Forms) • 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** • Environmental Ethics and Sustainability Practices in Ancient India • Techniques for Conserving Water (Stepwells, Temple Tanks, and Dams) • Agricultural Knowledge Systems (Crop Rotation, Indigenous Seeds, Zero Budget Natural Farming) • Indigenous Knowledge in Disaster Management and Climate Adaptation • 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. CSE (AI & ML)				Semester: I		
Course:	Life Skills I				Code:	BSH21CC01	
Credits	Teaching Scheme (Hrs. /Week)			Evaluation Scheme and Marks			
	Theory	Practical	Tutorial	OR	TW	PR	Total
2	-	4	-	-	100	-	100

Prior knowledge: Nil

Course Objectives: This course aims at enabling students:

1. To equip them with essential competencies that complement their academic education, preparing them to excel not only as engineers but also as well-balanced individuals.
2. To develop students‟ vital life skills that promotes personal growth, resilience, and success in their academic journey and beyond.

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

1. Demonstrate self-awareness and inner harmony conducive to understanding the essence of happiness.
2. Exhibit proficient interpersonal skills in fostering and sustaining healthy relationships with self &others.
3. Employ diverse strategies for rational decision-making and problem solving.
4. Display enhanced emotional intelligence through the recognition and management of emotions in various contexts.

Detailed Syllabus

Unit	Description	Duration (Hrs)
I	**Happy You, Happy Life!** Foundations of a Happy Mind • **Yoga, Meditation, Music, Dance and Visual Art** : Therapeutic techniques to improve mental clarity. • **Healthy Eating:** Cultivate mindful eating and maintain a nutritious & balanced diet. • **Significance of Physical Activity in Daily Routine:** The impact of physical activity to maintain positive outlooks towards life. **Self-Awareness & Goal Setting** • **Big Five Personality Traits (OCEAN Model):** Measures five broad traits: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism • **Know Your Personality:** Discover personal traits for deeper insight through personality test • **SMART Goals:** Set effective and achievable personal goals.	15
II	**Building Relationships** **Intrapersonal Intelligence:** Empathy, respecting boundaries & conflict resolution **Personal Relationships:** • **Relationship Web & Recipe:** Reflection on personal connections and support systems and explore what “ingredients” build strong personal bonds • **Attachment Styles and Their Impact:** Introduction to secure, anxious, avoidant, and disorganized attachment styles, reflection on how early experiences shape current relationship patterns and strategies to move toward healthier attachment behaviors	15

	• **Handling Transitions:** Managing changes like drifting apart, evolving roles, or ending relationships **Professional Relationships:** • **Professional Etiquette and Conduct:** Learning accountability and punctuality in workplace interactions, practice appropriate tone, email/meeting/messaging manners & etiquette, and collaboration ethics • **Networking and Relationship Mapping:** Identify mentors, peers, and professional contacts, build supportive academic and career networks	
III	**The Reflective Engineer** • **Critical & Creative Thinking:** Apply logical reasoning and original ideas to find effective and practical solutions. • **Convergent & Divergent Thinking:** Identify when to focus on a single solution or generate multiple ideas based on the nature of the task. • **Perspective Thinking:** Develop the ability to understand and consider viewpoints different from your own. • **Ethical Decision-Making and Problem-Solving:** Make fair, values-driven decisions while employing effective problem-solving strategies in both individual and team settings.	15
IV	**You CAN DO IT…** • **Understanding and Managing Emotions:** Self-regulation, assertiveness, aggression, emotional dependency versus interdependency and over thinking • **Stress Management:** Types of stress and healthy coping mechanisms. • **Peer Pressure & Addiction:** Types of peer pressure and strategies to resist negative influences.	15
	Total	**60**

References:

Books:

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

E Sources:

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

Course Syllabus

Semester II

Program:	B. Tech. CSE (AI & ML)						Semester: II	
Course:	Multivariate Calculus						Code:	BSH22BS07
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		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. Apply the concepts of partial differentiation to evaluate Jacobians, determine maxima and minima, and estimate errors and approximations
2. Evaluate derivatives and integrals of multivariable functions.
3. Represent the Fourier series for continuous and discrete periodic time domain functions in signal form
4. Compute definite improper integrals using Gamma, Beta function, and DUIS
5. Apply multiple integration techniques to determine Area, Volume

Detailed Syllabus

Unit	Description:	Duration [Hrs]
I	**Partial Differentiation:** Partial derivatives, Composite function, Chain Rule, variable to be treated as constant, total derivatives. Euler's theorem for homogeneous functions. **Application of Partial derivatives:** 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:** Beta and Gamma functions, differentiation under the integral sign (DUIS).	**7**
IV	**Multiple Integral:** Double integration, conversion into polar form, application of double integration to the area, Triple integration, Dirichlet's theorem, application of triple integration to 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 coursehttps://nptel.ac.in/courses/111107108
2. NPTEL Video for Fourier series http://nptel.iitm.ac.in

Program:	B. Tech. CSE (AI & ML)					Semester: II	
Course:	Multivariate Calculus Laboratory					Code:	BSH22BS08
Credits	Teaching Scheme (Hrs. /Week)			Evaluation Scheme and Marks			
	Theory	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	25	-	25	50

Prior knowledge:

1. Elementary Algebra.
2. Elementary Calculus
3. Basics of MATLAB/Open Source

Course Objectives: This course aims to enable students,

1. To equip with the ability to apply MATLAB 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 MATLAB programs to solve problems related to partial differentiation, integral calculus, multiple integrals, and Fourier series.
2. Prepare a well-structured technical Mini Project report and deliver an effective presentation with clarity and comprehensive understanding of the topic.

Detailed Syllabus

Expt. No.	List of Experiments using MATLAB
1	Computation of Higher and Mixed Order Partial Derivatives
2	Evaluation of Maxima and Minima
3	Evaluation of Jacobians
4	Representation of a 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	Area using Double Integral
10	Volume using Triple Integral
11	Mini Project* (14 hrs.)

***Mini Project Guidelines:**

Students must prepare a mini-project based on topics such as partial differentiation, integral calculus, multiple integrals, and Fourier series, 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
6. Introduction to MATLAB for Engineers and Scientists by Sandeep Nagar, Springer.
7. Introduction to MATLAB for engineering students by David Houcque, version 1.2, Northwestern University.

Program:	B. Tech. CSE (AI & ML)						Semester: II	
Course:	Engineering Chemistry						Code:	BSH22BS05
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	2	-	-	1	10	10	30	50

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

Course Objectives: This course aims at enabling students,

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

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

1. Analyze the water quality, interpret techniques of water purification and compare green over traditional synthesis of polycarbonate.
2. Recognize the fuel quality and understand the scope of derived alternate fuels
3. Apply the preventive methods of corrosion to real-life problems.
4. Understand the chemical structure and properties of various polymers, nanomaterials and their uses.

Detailed Syllabus

Unit	Description	Duration [Hrs]
I	**Water Technology and Green Chemistry:** a) Hardness of water, its types, units of hardness and hardness calculation. Chemical analysis of water by determination of hardness by EDTA method. Alkalinity of water and its determination. Numerical on EDTA method and alkalinity. Disadvantages of hard water in boilers. Water softening techniques: Permutit and Ion exchange method. Dissolved oxygen (DO), biological oxygen demand (BOD) and Chemical oxygen demand (COD). b) Introduction of Green Chemistry: Definition, goals, principles and green synthesis of Polycarbonate.	8
II	**Fuels and combustion:** a) Fuels: definition, calorific value and its units. Calorific value (CV), gross calorific value (GCV), net calorific value (NCV). Determination of calorific value - Bomb calorimeter, Boy‟s colorimeter and numerical. i) Solid fuels: coal, proximate and ultimate analysis of coal, numerical based on analysis of coal. ii) Liquid fuels: composition of petroleum, refining of petroleum. Synthesis, properties, advantages and disadvantages of Power alcohol and Biodiesel. iii) Gaseous fuels: Hydrogen gas as a future fuel, production by steam reforming of methane and by electrolysis of water. Challenges in storage and transportation of H2 gas.	7

	b) Combustion: chemical reactions, calculations on air requirement for combustion.	
III	**Corrosion and Corrosion control:** a) 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. b) 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.	7
IV	**Chemistry of Polymers and Novel Carbon Compounds:** a) Polymers: definition, classification of polymers on the basis of thermal behavior, properties of polymers: degree of polymerization, crystallinity, Tg& Tm and factors affecting Tg. Polymerization and its types. Advanced polymeric materials: Structure, properties and applications of liquid crystal polymer – Kevlar, conducting polymers - Polyacetylene, electroluminescent polymer – PPV and biodegradable polymers – PHBV. b) Nanomaterials: definition, types of nanomaterials and properties of nanomaterials. Quantum dots: Types, properties and applications of QDs. Structure properties and applications of Graphene and Carbon Nano Tubes (CNTs).	8
	Total	**30**

Text Books:

1. Engineering Chemistry by S.S. Dara, S.Chand Publications (2010).
2. Engineering Chemistry by B.S. Chauhan, UnivScPress.(2015).
3. A TextBook of Engineering Chemistry by ShashiChawla, DhanpatRai& Co. (2015).
4. Nanotechnology: principles and practices by S.K. Kulkarni, Springer (2014).
5. Engineering Chemistry by Jain and Jain, DhanpatRai Publishing Co.(2016).
6. Engineering Chemistry by Wiley India (2012).
7. Engineering Chemistry by O.G. Palanna, McGraw-Hill Education.
8. Introduction to Nanoscience and Nanotechnology by K. K. Chattopadhyay, A. N. Banerjee. PHI Learning (2009).

Reference Books:

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

1. **e-sources:**
2. https://nptel.ac.in/
3. https://www.coursera.org/
4. https://link.springer.com/
5. https://www.sciencedirect.com/
6. https://pubchem.ncbi.nlm.nih.gov/
7. https://directory.doabooks.org/

Program:	B. Tech. CSE (AI & ML)				Semester: II		
Course:	Engineering Chemistry Laboratory				Code:	BSH22BS06	
Credits	Teaching Scheme (Hrs. /Week)			Evaluation Scheme and Marks			
	Theory	Practical	Tutorial	TW	OR	PR	Total
2	-	4	-	50	-	50	100

Prior knowledge of

1. Theory of acids and bases
2. Molarity, normality and molality
3. Titration method

Course Objectives:

1. To help students to procure conceptual clarity of Engineering Chemistry through laboratory experiments.
2. To develop experimental skills to acquire insight into societal and environmental issues.

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

1. Volumetric analysis for determination of quality of water.
2. Apply various instrumental methods for quantitative and qualitative chemical analysis.
3. Demonstrate the skill for synthesis of engineering materials.
4. Learn the chromatographic separation technique and impact of corrosion.
5. Explore mini projects which are relevant to societal and environmental issues, to develop research attitudes.

Guidelines:

1] Under Group A category, students have to perform all experiments from the list given below.
2] Under Group B category, students have to perform a mini project or case studies.

Detailed Syllabus

Expt. No.	Group A: Suggested List of Experiments
1	Safety in the Engineering Chemistry Laboratory.
2	Determination of total hardness of water sample by EDTA method.
3	Determination of type of alkalinity of given water sample and extent of alkalinity.
4	To determine the chloride ion (Cl^-) present in a given water sample by argentometric method.
5	To determine the dissociation constant of a weak acid (acetic acid) using a pH meter.
6	Titration of mixture of strong acid with strong base using Conductivity meter and determine strength of acid.
7	Proximate analysis of Coal.
8	To estimate the amount of Fe (II) present in the given solution potentiometrically.
9	To determine the maximum wavelength of absorption of $KMnO_4$, verify Beer's law and find concentration of the unknown sample.
10	To determine the electrochemical equivalent (ECE) of Cu.
11	To prepare the Phenol formaldehyde resin.
Group B: Mini project Activity and Case studies	
Topics for Mini project: (Student has to choose one of the topics from list given below but not limiting to)	
1	Adsorption studies of methylene blue on bio adsorbents prepared from agricultural waste.
2	Colloidal synthesis of 2-6 or 3-5 semiconductor quantum dots nanoparticles.
3	Determination of active ingredients from medicines / concentration of dyes in commercial beverages using UV.
4	Green synthesis of chemical compounds.
5	One-pot synthesis of biologically active compounds.
6	Microwave assisted chemical reactions.

7	Soil analysis of agricultural soil samples.
8	Adulterants in food materials.
9	Determination of acid value of oils.
10	Detection of presence of carbohydrates, fats and proteins in given foodstuffs.
11	Preparation of biodiesel.
12	Water audit of water samples.
13	Separation of mixture by chromatographic techniques.
	Topics for Case Studies: **(Student must choose three topics from list given below but not limiting to)**
1	Water audit of samples from different water bodies in and around PCMC area.
2	Impact of corrosion in our daily life.
3	Application of principles of green chemistry in manufacture of pharmaceuticals.
4	Production of renewable fuels from non-petroleum resources.
5	Hydrogen powered cars – the wave of the future. Current state of affairs of hydrogen run cars in India.
6	Need and applications of biodegradable polymers – a step towards cleaner world.

References:

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

Program:	B. Tech. CSE (AI & ML)						Semester:II	
Course:	Data Science						Code:	BCS22ES04
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: Mathematics **is essential**

Course Objectives:

1. To solve numerical problems using the concepts of linear algebra and matrices.
2. To demonstrate the use of mathematical techniques in the field of data science.
3. To explain the theory of statistics and its use in statistical inference.
4. To perform the data preprocessing operations.
5. To demonstrate the use of data visualization and data analytics techniques.

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

1. Identify the need of data pre-processing/visualizations operations and apply those to prepare the data
2. Use linear algebra and matrices for problem-solving.
3. Perform statistical analysis to understand the data representation by computing various statistical Measures.
4. Apply various hypothesis tests on sample data and provide inferences.
5. Analyze and solve the regression and classification problems for data analysis.
6. Apply the model evaluation techniques using different performance measures

Detailed Syllabus

Unit	Description	Duration [Hrs]
I	Introduction to Data Science: Data Science Life Cycle, Data Analytics and Types, Key performance indicators of data science projects. Data Preprocessing: Need, preprocessing techniques for: handling redundant data, data transformation, replacing or handling missing data, and handling data inconsistency. Data Visualization: Introduction, need, Data visualization techniques: line plot, scatter plot, histogram, density plot, box plot, bar plot, pie chart, heatmap, etc.	8
II	Mathematics for data science: Linear Algebra: Introduction to Linear Algebra, Matrices and Vectors in Data Science. Vector – vector space, Column vectors, row vectors, working with vectors. Matrices: types of matrices, Addition of Matrices and their properties, Matrix multiplication and their properties. Linear combination as a matrix-vector product.	8
III	Mathematics for data science: Matrices: Transpose of Matrices, properties of Transpose. Determinants: Determinants and their properties, Cramer‟s Rule, Inverses. Introduction Minors and Cofactors in a Determinant, Properties of Determinants, Differentiation of a Determinant, Rank of a Matrix, Systems of linear equations, Row reduction, Echelon form and its Properties, Eigenvalues and Eigenvectors.	7

IV	Statistics and Inference: Measures of central tendency, Measures of variability: standard deviation, variance, quartiles, Interquartile range. Skewness and Kurtosis. Sampling & Inference: Sampling: Introduction, types of sampling. Hypothesis testing, types of errors, level of significance, test of hypothesis: t-test, z-test, chi-square, ANOVA. Correlation analysis: Pearson's correlation coefficient.	8
V	**Regression:** Understanding Linear regression. Lines of regression – numerical problems. Performing a linear Regression: Linear function, Fitting the line, residual errors, coefficient of determination. Multiple linear regressions. Understanding Logistic regression. Performing a logistic Regression: Logistic function, fitting the curve, understanding the log-odds, R-Squared. Multivariate logistic Regression.	7
VI	**Data Analytics and Model Evaluation:** Introduction to classification, Naive Bayes classifier. Model Evaluation and Selection: holdout method, random sub-sampling, cross-validation. Model's parameter tuning and optimization. Performance metrics for evaluation of model, confusion matrix, AUC-ROC analysis. Model building and validations for Naïve Bayes classifier and for logistic regression.	7
	Total	**45**

Text Books:

1. Thomas Nield, "Essential Math for Data Science", O'Reilly Media Inc., October 2022, ISBN: 9781098102869.
2. Data Science and Big Data Analytics, EMC education services, Wiley publication, 2015, ISBN: 9781118876138.

Reference Books:

1. Peter Bruce, Andrew Bruce, Peter Gedeck, "Practical Statistics for Data Scientists", O'Reilly Media, 2nd edition, May 2020, ISBN: 9781492072942.
2. Norman Matloff ,"Probability and Statistics for Data Science", CRC Press, 2019, ISBN:9780429687112.

e-sources:

1. NPTEL Course on "Python for Data Science" :https://onlinecourses.nptel.ac.in/noc22_cs74/preview
2. NPTEL Course on "Data Science for Engineers" : https://onlinecourses.nptel.ac.in/noc22_cs72/preview

Program:	B. Tech. CSE (AI & ML)					Semester: II	
Course:	Data Science Laboratory					Code:	BCS22ES05
Credits	Teaching Scheme (Hrs. /Week)			Evaluation Scheme and Marks			
	Theory	Practical	Tutorial	TW	OR	PR	Total
2	-	4	-	50	-	50	100

Prior knowledge of Computer Programming & Problem Solving are essential

Course Objectives:

1. To write software programs using linear algebra, matrices, and using data structures in Python.
2. To apply mathematical techniques in the field of data science for analysis of data.
3. To use the theory of statistics for data analysis.
4. To learn the data preprocessing and data visualization techniques.
5. To perform regression analysis and classification tasks for various applications.

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

1. Implement data preprocessing techniques to prepare the data for analysis.
2. Implement data visualization techniques to analyze data graphically.
3. Perform statistical analysis to understand the data representation by computing statistical measures.
4. Write a software program to perform hypothesis tests on sample data.
5. Implement the regression techniques for data analysis.
6. Develop a classification model and evaluate its performance.

Guidelines for Students:

The suggested list of assignments is given below. Instructors can frame suitable assignments based on scenarios. Students should perform all assignments compulsorily using Python. As per assignment requirement, an open-source data can be downloaded from the web (Kaggle, github, UCI ML repository, OpenML, Datahub, Data.gov, etc).

Guidelines for Laboratory / Term Work Assessment:

1. Continuous assessment of laboratory work is done based on the overall performance and laboratory performance of the 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.

Expt. No.	Suggested List of Experiments
1	Write programs using Python language constructs. Suitable 2 assignments will be framed based on topics such as: Data types and data structures in Python– lists, array, dictionary, tuple, etc. Reading data from files. Different types of language constructs: operators, control structures, functions. Python libraries like pandas, NumPy, etc. Suggested list is as follows: a. Write a python program to create a list of random numbers in normal distribution and display the frequency of each value. b. Write a python program to print the odd and even numbers from a given range taken as per user input and display the prime numbers from the first 20 odd numbers. c. Write a python program to read any .csv file as per user-provided input and display its content
2	Write programs using Python language constructs. Suitable 2 assignments will be framed based on topics such as: Data types and data structures in Python– lists, array, dictionary,

	tuple, etc. Reading data from files. Different types of language constructs: operators, control structures, functions. Python libraries like pandas, NumPy, etc. Suggested list is as follows: a. To reverse the tuple or unpack the tuple into multiple variables or access a specific value from tuple b. To merge two dictionaries or create a dictionary by extracting only key values from any given dictionary.
3	Write programs using Python language constructs and Python libraries like NumPy to perform linear algebra operations. Suitable any 2 assignments can be framed. The suggested list is as follows: a. To perform addition and subtraction of matrices b. To perform multiplication and division of matrices
4	Write programs using Python language constructs and Python libraries like NumPy to perform linear algebra operations. Suitable any 2 assignments can be framed. The suggested list is as follows: a. To find the transpose of a matrix b. To solve linear systems of equations by implementing matrices and vectors
5	Perform the following data preprocessing operations using Python and pandas on any Open-source dataset. a. Data preprocessing operations: check for missing values, noisy data, null values, etc. and handle those. b. Data Integration and Data Normalization: Summarize the types of variables by checking the data types (i.e., character, numeric, integer, factor, and logical) of the variables in the data set. If variables are not in the correct data type, apply proper type conversions. Perform data transformations suitably like normalization, standardization, etc. Turn categorical variables into quantitative variables
6	Create an "Academic performance" dataset of students and perform the following operations using Python. a. Scan all variables for missing values and inconsistencies. If there are missing values and/or inconsistencies, use any of the suitable techniques to deal with them. b. Scan all numeric variables for outliers. If there are outliers, use any of the suitable techniques to deal with them.
7	Create an "Academic performance" dataset of students and perform the following operations using Python. a. Apply data transformations on suitable variables. The purpose of this transformation should be one of the following reasons: to change the scale for better understanding of the variable, to convert a non-linear relation into a linear one, or to decrease the skewness and convert the distribution into a normal distribution.
8	Write a program for Data Visualization using IRIS flower dataset or any other suitable public dataset . a. Create a histogram for each feature in the dataset to illustrate the feature distributions. Plot each histogram. b. Create a boxplot for each feature in the dataset. All of the boxplots should be combined into a single plot. Compare distributions and identify outliers.
9	Write a program for Data Visualization to create any 6 types of graphs. Select the right chart for data visualization as per requirements like visualization required for comparisons, identification of relationships, identification of trends over time, part of a whole, understanding the distribution of data values, etc. Create graphs among types such as Line plot, Scatter plot, bar plot, Density plot, pie chart, bubble plot, heat maps, tree map, correlation matrices, dendrograms, etc. Use Pima Indians Diabetes dataset or time

	series data or any other suitable public dataset.
10	Write a python program to perform descriptive statistics to compute various statistical measures by using Pandas library. Use IRIS flower dataset or any other suitable public dataset.
11	Write a program to perform hypothesis testing for a suitable dataset. Select appropriate hypothesis testing strategies such as t-test, z test, chi-square test, ANOVA test, etc
12	Write a program to implement linear or logistics regression using any suitable public dataset OR the following scenario of Bigmart Sales Analysis may be considered: Perform prediction for the sales of a store using linear or logistics regression. Sample test data set is available here https://datahack.analyticsvidhya.com/contest/practice-problem-big-mart-sales-iii/
13	Write a program to perform classification using Naïve Bayes classifier. Calculate the probabilities by implementing the Bayes theorem using Pima Indians Diabetes dataset or any other suitable public dataset. Measure the performance of the classifier for separate test and training data using various metrics.

Text Books:

1. Thomas Nield ," Essential Math for Data Science" - ,Released October 2022 Publisher(s): O'Reilly Media, Inc. ISBN: 9781098102869.

Reference Books:

1. Peter Bruce, Andrew Bruce, Peter Gedeck, "Practical Statistics for Data Scientists"- · 2020 , ISBN:9781492072898, 1492072893 ,Published:10 April 2020 ,Publisher:O'Reilly Media.
2. Norman Matloff, "Probability and Statistics for Data Science" - Norman Matloff · 2019, ISBN:9780429687112, 0429687117 , CRC Press, Published:21 June 2019
3. Chirag Shah, "A Hands-On Introduction To Data Science", Cambridge University Press,(2020), ISBN : ISBN 978-1- 108-47244-9.
4. Wes McKinney, "Python for Data Analysis", O' Reilly media, ISBN : 978-1-449-31979-3.

Program:	B. Tech. CSE (AI & ML)						Semester: II	
Course:	Software Engineering						Code:	BCS22PC01
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	2	-		1	10	10	30	50

Prior knowledge of Computer Programming and Problem Solving **is essential.**

Course Objectives:

1. To learn the principles of Software Engineering.
2. To learn process models for software project development
3. To learn the methods of capturing, specifying, and analyzing software requirements.
4. To learn design principles to software project development.

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

1. Understand the principles of Software Engineering and apply appropriate process models for specific software project development.
2. Analyze software requirements and apply architectural principles and design methods for software development.
3. Analyze the agile software development methodologies.
4. Understand CASE, CASE tools and techniques, SPI, Reverse Engineering and web Engineering.

Detailed Syllabus

Unit	Description	Duration [Hrs]
I	**Introduction and Software Process Models:** Software Engineering, Myths, Software Process, Software development life cycle, Work Products, Importance of Software Engineering, Standard for Software Process, Waterfall Model, Prototyping Model, Iterative Enhancement Model, Spiral Model, RAD model, 4th Generation models, Formal Methods, Agile Development Case Study: Introduction to Safe Home.	**8**
II	**Software Requirement Specification, Design and Coding:** Requirements Engineering- Problem analysis, Establishing the Groundwork-Eliciting Requirements, Requirements Analysis-Requirements Modeling Strategies.Design Concepts, Modularity, Architectural design, Coupling and Cohesion, Top-down and bottom-up design, Software Design Document, Coding styles and documentation	**7**
III	**Agile development:** Agile Process- Extreme Programming in agile development, Pair Programming in agile development, Agile software development process Models: SCRUM, Sprint Cycle, Sprint Cycle Stages, SCRUM master, Kanban Boards and Methodology, Comparison of Agile with Conventional process models.	**8**
IV	**Computer Aided Software Engineering and Advanced Topics:** Computer Aided Software Engineering (CASE) and its Scope, CASE support in Software Life Cycle, Architecture of CASE Environment, Upper CASE and Lower CASE, Exposure to CASE tools. Software	**7**

	Process Improvement, Component Based Software Engineering, Web Engineering, Reverse Engineering, Software Engineering challenges of Big Data, Mobile Applications	
	Total	**30**

Textbooks:

1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach," Pearson Education, 7th Edition, 2010.
2. Ian Sommerville, "Software Engineering," 9th edition, 2010.
3. N.S. Gill, Software Engineering, Khanna Publishing Co., Delhi, 2018.
4. Software Engineering (3rd ed.), by K.K. Aggarwal & Yogesh Singh, New Age International Publishers, 2007.

Reference Books:

1. Carlo Ghezzi, "Fundamentals of Software Engineering," Prentice Hall India, ISBN 10: 0133056996, 2002.
2. Rajib Mall, "Fundamentals of Software Engineering," Prentice Hall India, ISBN 13: 978-8120348981, 2014.
3. Pankaj Jalote, "An Integrated Approach to Software Engineering," Springer, ISBN 13: 9788173192715, 2010.

e-sources:

https://nptel.ac.in/courses/106105087

Program:	B. Tech. CSE (AI & ML)					Semester: II	
Course:	Object oriented programming using C++					Code:	BCS22VS02
Credits	Teaching Scheme (Hrs. /Week)			Evaluation Scheme and Marks			
	Theory	Practical	Tutorial	TW	OR	PR	Total
2	–	04	–	50	50	–	100

Prior knowledge:
Computer Programming and Problem Solving is essential

Course Objectives:
1. To develop solutions by using various OOP features for various applications.
2. To strengthen problem-solving ability by using the characteristics of an object-oriented approach.
3. To develop programming skills using Object oriented concepts.

Course Outcomes: After learning the course, the students will be able to:
1. Apply various object-oriented concepts for problem-solving.
2. Apply inheritance and polymorphism to write object-oriented programs.
3. Develop the solutions using generic templates, exception handling, and STL.
4. Write programs to perform file-handling operations.

Guidelines for Laboratory Conduction:
1. Instructor is expected to teach Object oriented programming concepts before conducting assignments.
2. Assignments should be implemented in C++ language.
3. Operating System recommended: - 64-bit Open source Linux or its derivative.
4. Programming tools recommended: - G++/GCC, Eclipse,VS Code, QT creator.
5. All Assignments are compulsory.

Expt. No.	Suggested List of Experiments
1	**Concepts:** variables and constants, Class – Data members, Member Functions, and class as abstract data type, Object Visibility Modes, Array of Objects. **Assignments:** Write a program Illustrating Class Declarations, Definition, and Accessing Class Members. 1. Write a C++ program to implement a class called Circle that has private member variables for radius. Include member functions to calculate the circle's area and circumference. (Class, Object, Member Function and Access specifier) 2. Create a class 'Student' with three data members which are name, age and address. The constructor of the class assigns default values to name as "unknown", age as '0' and address as "not available". It has two functions with the same name, 'setInfo". First function has two parameters for name and age and assigns the same whereas the second function has three parameters, which are assigned to name, age and address respectively. Print the name, age and address of 10 students.(array as object)
2	**Friend Class, Friend Function, Static data Members, Static Function, Inline Function:** Write a Program Using following concepts: a. Friend Class, b. Friend Function, c. Static data Members, d. Static Function, e. Inline Function 1. Create a class called Box with a variable: width of type double. Inside the class define a constructor and a friend that prints the width value(printWidth). In the main() define a Box instance, set values and call printWidth. (Friend Function) 2. Design a class A and a class B. Make class B a friend of class A. Implement member functions in both classes to demonstrate the use of friend class. 3. Develop a class Counter to count the number of objects created. Use a static data member to keep track of the count. Implement member functions to increment and display the count.

	4. Create a class Math with static functions for addition, subtraction, multiplication, and division. Demonstrate the use of static functions to perform mathematical operations without creating an object of the class.
3	**Constructor:** Default constructor, parameterized constructor and copy constructors and Destructor, Order of Constructor and Destructor Call. **Assignments:** Write a program and input two integers in main and pass them to default constructor of the class. Show the result of the addition of two numbers. (Default Constructor) Create a class called Rectangle.It should contain a constructor for width and height, a function that returns the area and a friend function that duplicate the rectangle's dimensions. In the main, create a rectangle instance, duplicate it and print out the area. (Parameterized and Copy Constructor) Write a program to illustrate default constructor, parameterized constructor and copy constructors. Program should illustrate the order of execution of constructors and destructors when a new class is derived from more than one base class.
4	**Inheritance and its Types:** Simple, Multilevel, Hierarchical, Multiple and Hybrid**,** Ambiguity in multiple inheritance. **Assignments:** Write C++ programs that illustrate how the following forms of inheritance are supported: Single inheritance Multiple inheritance Multilevel inheritance Hierarchical inheritance. Write a program with a mother class and an inherited daughter class.Both of them should have a method void display ()that prints a message (different for mother and daughter).In the main, define a daughter and call the display() method on it. Write a program with a mother class animal. Inside it define a name and an age variables, and set value () function. Then create two bases variables Zebra and Dolphin which write a message telling the age, the name and giving some extra information (e.g. place of origin).
5	**Polymorphism:**Operator Overloading: Unary and Binary, Virtual Function, Function Overloading **Assignments:** Implement a class Complex, which represents the Complex Number data type. Implement the following operations: Constructor (including a default constructor which creates the complex number 0+0i). Overloaded operator + to add two complex numbers. Overloaded operator * to multiply two complex numbers. Overloaded << and >> to print and read Complex Numbers. (Operator Overloading) Write a program defining class Distance that stores feet and inches. Overload operator + to add two instances of class Distance and return the result in another instance. Overload comparison operator < which will compare two instances of class Distance and return true or false. Overload += to add two distances and store the result in the one of them. Overload = operator to assign one distance to the other. (Operator Overloading) Write a C++ program to implement a class called Shape with virtual member functions for calculating area and perimeter. Derive classes such as Circle, Rectangle, and Triangle from the Shape class and override virtual functions accordingly. (Virtual Function) Implement a class StringOperations with overloaded functions to concatenate two strings, to concatenate a string with an integer, and to reverse a string. Test these functions with various inputs to demonstrate their versatility.

6	**ADT Using Class, Pure virtual function, Abstract class.** 1. Write a C++ program to implement the matrix ADT using a class. The operations supported by this ADT are: a. Reading a matrix. b. Addition of matrices. c. Printing a matrix. d. Subtraction of matrices. e. Multiplication of matrices.
7	**Generic Programming:** Class Template and Function Template, Class template with Multiple parameters **Assignments:** Write a class template to represent a generic vector. Include member functions to perform the following tasks: a. To create the vector. b. To modify the value of a given element. c. To multiply the vector by a scalar value. d. To display the vector in the form (10, 20, 30)
8	**Exception Handling:** Fundamentals multiple catching nested try statements uncaught exceptions throw and rethrow 1. Write a C++ program that takes two numbers as input from the user and performs division. Implement exception handling to catch division by zero errors and prompt the user to enter valid inputs. 2. Write a C++ to handle the exception if account balance is less than minimum balance. 3. Write a program that prompts the user to enter their age. Implement exception handling to ensure that the input is a valid integer and handle any ValueError exceptions that may occur.
9	**File Handling:** Write a program to maintain an employee database in a binary file with employee information such as empId, name, age, department, post and salary. Write function for adding new records, displaying all records, searching for a particular employee, updating employee salary and post.
10	**Standard Template Library: Stack, Queue, Map** 1. Write a C++ program using STL to perform various stack and queue operations. 2. Write C++ program using STL map for managing Person Records (Name, birth date, telephone no). Perform operations – add, display, search, delete, and update. 3. Write C++ program using STL to add binary numbers (assume one bit as one number); use STL stack.

References:

1. Herbert Schildt, "C++: The Complete Reference", McGraw Hill Education, 4th Edition, July 2017, ISBN-10 : 007053246X (ISBN-13 : 978-0070532465).
2. Bjarne Stroustrup, "The C++ Programming language" , Pearson Education , Third edition, 2008, ISBN 9780201889543.

Program:	B. Tech. CSE (AI & ML)						Semester: II	
Course:	English						Code:	BSH22AE01
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	1	2	-	-	10	10	30	50

Prior knowledge of:
Basic knowledge of English Language is essential.

Course Objectives: This course aims at enabling students:

1. To develop basic LSRW skills for effective communication.
2. To develop a sense of confidence among students to present themselves at professional as well as societal level.
3. To enhance the language competence with responsible use of AI

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

1. Understand the role of effective listening skills, grammar and vocabulary in effective communication.
2. Formulate grammatically correct sentences and Enrich their vocabulary
3. Demonstrate reading skills to comprehend various documents
4. Communicate effectively and enhance their phonetic skills.

Detailed Syllabus

Unit	Description	Duration [Hrs]
I	**Listening Skills:** Importance of Listening Skills, Types of Listening: Active / Selective / Passive Listening, Barriers to Listening, Tips to Improve Listening Skills.	3
II	**Writing Skills:** Grammar & Vocabulary:Common Errors in English, Modal Auxiliaries. Processes of Word Formation, Words often Confused,Elements of Effective Writing, Writing Styles (Formal & Informal), Paragraph Writing (Descriptive, Technical). Professional Writing:Job Application, Leave Application, Enquiry and Complaint Letter. Report Writing. AI application in writing	4
III	**Reading Skills:** Importance of Reading, Scanning, Skimming, Reading between the Lines, Reading Comprehension: Factual / Expository / Informative texts, Case Studies, Reading Research Articles. Lesson:1 The Story of An Hour by Kate Chopin, Lesson: 2 The Classical Student by Anton Chekhov	4
IV	**Speaking Skills:** Basic Sounds-IPA, Word Stress, Intonation, Language Functions (Requesting, Apologizing, Complaining, Complementing, Thanking, etc) Art of Asking and Responding to Questions, Impromptu Speaking, Art of Extempore & Presentations, Role Play, Delivering Welcome Speech, Vote of Thanks, Group Discussion	4
	Total	**15**

Lab Session	Activities	Duration
1	Listening 1: Listen to the audio and answer the questions (IELTS) Cambridge Assessment - Free Tool	2
2	Listening 2: Listen to the audio and Summarize (Ted Talks)	2

3	Grammar: Correct the sentences and understand the business usages.	2
4	Vocabulary: Different ways to improve vocabulary - AI-based activities for vocabulary enrichment	2
5	Writing Skills 1: Formal writing such as Job Application, Leave Application, Enquiry and Complaint Letter. Writing a personalized letter followed by applying AI for polishing of grammar and vocabulary.	2
6	Writing Skills 2: Different Styles of writing and Paragraph Writing (Descriptive, Technical)	2
7	Writing Skills 3: Report Writing; Progress, Accident Report, Event Report - Using AI to formulate a structured report and learning how to customize it for maximum relevance.	2
8	Reading Activity 1: Communication Case Studies	2
9	Reading Activity 2: IELTS based Comprehension Skills	2
10	Reading Activity 3: Research Articles and Technical Documents	2
11	Reading Activity 4: Literary Reading and Discussion	2
12	Speaking Activity 1: IPA Pronunciation and Phonetics Exercises	2
13	Speaking Activity 2: Delivering speeches and Mastering the Art of Public Speaking	2
14	Speaking Activity 3: Preparing and Participating Group Discussions / Elevator Speeches	2
15	Speaking Activity 4: Oral/PPT Presentation with Q&A Session	2
	Total	**30**

Text Books:

1. Raymond Murphy, Essential English Grammar in Use, Cambridge University Press; 2015

Reference Books:

1. Michael Swan, Practical English Usage, Oxford, 3rd Edition; 2005
2. David F. Beer, Writing and Speaking in the Technology Professions: A Practical Guide, Wiley-IEEE Press; 2nd Edition, 2003
3. Sunita Mishra, C. Muralikrishna, Communication Skills for Engineers, Pearson Education; 2011
4. Clifford Whitcomb, Leslie E. Whitcomb, Effective Interpersonal and Team Communication Skills for Engineers, Wiley–Blackwell; Nil edition, 2013.
5. Krishnaswami, N and Sriraman, T, Creative English for Communication, Macmillan.Saran Freeman, Written Communication in English, Orient Longman

e-sources:

1. https://www.google.com/url?q=https://onlinecourses.nptel.ac.in/noc19_hs19/&sa=D&source=editors&ust=1654924489543365&usg=AOvVaw0vWlA1-FXdmtGD4TbPCXo-
2. https://www.google.com/url?q=https://onlinecourses.nptel.ac.in/noc19_hs22/&sa=D&source=editors&ust=1654924489545718&usg=AOvVaw1JiV6Z4RihjTKbm8Sd2HDC
3. https://takeielts.britishcouncil.org/take-ielts/prepare/free-ielts-practice-tests/listening/section-1

Program:	B. Tech. CSE (AI & ML)						Semester: II	
Course:	German						Code:	BSH22AE02
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	1	2	-	-	10	10	30	50

Prior knowledge of:
English Language is essential.

Course Objectives: This course aims at enabling students,
1. To get familiar with the basics of German language and develop their interest in the language.
2. To identify the desired information while reading and listening simple German texts.
3. To acquire basic knowledge of German speaking countries.
4. To frame simple sentences in German.

Course Outcomes: After learning the course, the students should be able to:
1. Demonstrate an understanding of simple texts in German.
2. Apply basic grammar rules to frame simple sentences in German.
3. Develop simple dialogues in German reflecting situations encountered in daily life.
4. Construct simple texts in German.

Detailed Syllabus

Unit	Description: Times new Roman- Font size-11	Duration [Hrs]
I	**Introduction to German Language** **Topics:** Greetings; Alphabet; Numbers; Days; Months; Seasons; Personal details; Family; Hobbies; Self-introduction; Things of day-to-day use; Food & Beverages; Buying goods of day-to-day use; Clock time; Basic knowledge of German speaking countries **Listening skills:** Listen and understand spellings, numbers, clock time, details of persons, short easy day-to-day conversations in German **Reading skills:** Read and comprehend from visiting cards, brief profiles, simple instruction boards and advertisements, short easy texts, short messages, short letters, and emails in German, read texts aloud and respond by answering questions accordingly	4
II	**Basic German Grammar and Sentence Structure** • Personal Pronouns: Nominative • Verbs and Verb-Conjugation: Regular, irregular, separable, modal auxiliaries • Types of Articles: Definite, indefinite, negative, possessive • Cases: Nominative, accusative • Prepositions: With accusative case • Types of the sentences: Declarative, interrogative, imperative • Tenses: Present tense Solving simple grammar exercises to get used to basic sentence structure in German	4

III	**Speaking Skills** • Spelling and pronouncing words correctly • Giving brief self-introduction in German • Asking for personal details and providing the required information • Requesting for things of day-to-day use and reacting on requests in appropriate manner • Carry out short easy German dialogues with expressions	3
IV	**Writing Skills** • Writing short easy sentences in German • Using German punctuation and orthographic rules correctly in given texts • Taking dictation for words and simple sentences • Correcting errors in given texts • Writing simple texts, short messages, letters emails on given topics	4
Total		**15**
Lab	**Activities**	**Duration (Hrs)**
1	**Vocabulary:** Exercises torecall and enhance vocabulary	2
2	**Listening 1:** Listen to the audio and repeat(phonetics)	2
3	**Listening 2:** Listen to the audio and select the correct option	2
4	**Reading 1:** Read short easy texts and fill up the information in table	2
5	**Reading 2:** Read short easy texts and mark true or false	2
6	**Reading 3:** Read short easy texts and answer the questions	2
7	**Grammar 1:** Solve simple grammar exercises	2
8	**Grammar 2:** Construct correct sentences by applying grammar rules	2
9	**Speaking 1:** Spell and pronounce the words correctly	2
10	**Speaking 2:** Give your short introduction	2
11	**Speaking 3:** Frame simple questions, requests and reply	2
12	**Writing 1:** Fill up simple data in registration forms	2
13	**Writing 2:** Correct errors in given draft	2
14	**Writing 3:** Fill in the sentences and rewrite the texts, short messages, emails, and letters	2
15	**Presentation:** Basic geographicalinformation of India and German speaking countries in German	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

Program:	B. Tech. CSE (AI & ML)						Semester: II	
Course:	Japanese						Code:	BSH22AE03
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	1	2	-	-	10	10	30	50

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

Course Objectives:

1. To be aware of Japanese Scripts (Hiragana, Katakana) and basic Kanjis
2. To familiarize themselves with the Japanese language and use basic greetings in day-to-day life.
3. To express themselves using basic sentences and develop cross cultural skills and understanding of gestures, family and community, perceptions.
4. To develop language skills namely Listening, Speaking, Reading and Writing skills for socializing, at basic level.

Course Outcomes:

1. Recognize Japanese scripts through oral and written communication.
2. Interact with the people using Japanese greetings in to their day-to-day life.
3. Demonstrate the basic Kanjis with meanings.
4. Construct simple demonstrative sentences.

Detailed Syllabus

Unit	Description:	Duration [Hrs.]
I	Introduction: **Hiragana Script.** Listening: Short video skit on self-introduction Speaking: Song of greetings. Reading: Hiragana words Writing: Japanese scripts (Hiragana) Test on Hiragana	5
II	Introduction: **Katakana script** Listening: English words Speaking: Song on body parts. Reading: Katakana words Writing: Locating countries on map, Word hunt.	4
III	Introduction to Kanjis Writing: Learn to write kanjis with stroke order.	3
IV	わたしはマイク.ミラーです。 Listening: Conversation based on L-1 Speaking: Self introduction Reading: Lesson reading no.-1 Writing: Writing about yourself. Grammar: Introduction to1.Particles (は、か、も、か) 2.Verbs (です、ではありません)	3
	Total	**15**

Lab sessions	Activities	Duration (Hrs.)
1	Writing Skill 1: Hiragana script	2
2	Speaking skill 1: Japanese greetings	2
3	Reading Skill 1: Reading and recognizing 'Hiragana' words	2
4	Listening Skill 1: Listening and writing 'Hiragana' words	2
5	Reading Skill 2: Reading 'Katakana' words	2
6	Writing Skill 2: World map activity	2
7	Speaking Skill 2: Self introduction	2
8	Listening Skill 3: Listening and identifying the numbers.	2
9	Reading Skill 3: Reading Numbers with writing practice.	2
10	Speaking Skill 3: Practicing Japanese Greetings.	2
11	Writing Skill 3: Creating Kanjis chart using strokes, 'Kun Yomi' and 'On Yomi'	2
12	Listening Skill 4: Conversation in the office	2
13	Speaking Skill 4: Dialogues between people of different nationalities.	2
14	Reading Skill 4: Chapter-1 reading	2
15	Writing Skill 4: Basic sentence formation using grammar.	2
	Total	**30**

Text Books:

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

Reference Books:

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

e-sources:

Japanesepod101.com
https://www.nihongonomori.com
onlinecourses.nptel.ac.in/noc19_hs52/preview
onlinecourses.nptel.ac.in/noc24_hs121/preview

Program:	B. Tech. CSE (AI & ML)						Semester: II	
Course:	Business Storytelling						Code:	BSH22AE04
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		SA	Total
					FA1	FA2		
2	1	2	-	-	10	10	30	50

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

Course Objectives: This course aims at enabling students:
1. To understand storytelling as one of the tools of influential communication.
2. To strengthen their creativity, critical thinking and social skills.
3. To use stories to face leadership, management and professional challenges.

Course Outcomes: After learning the course, the students will be able to:
1. Identify nuances of storytelling method as an influential communication
2. Demonstrate the ability to engage and inspire others through the development of narratives, tone and style
3. Apply storytelling techniques to communicate effectively in a business context
4. Develop stories to build, maintain professional relationships, deliver messages and motivate others toward action.

Detailed Syllabus

Unit	Description	Duration [Hrs.]
I	**Concept and Scope:** What is a story? A Brief History & Importance of Storytelling, Basics of Storytelling- Entertainment, Engagement, Personalization, Critical Thinking, Observation Skills in Storytelling, Benefits of Storytelling, Storytelling in Engineering, Business Storytelling **Activity:** Analysis of Steve Jobs Commencement Speech at Stanford(2005)	3
II	**Process of Storytelling:** Elements of a Story - Context and Relevance, Style and Detailing, Plot, and Characters, The Flow of the Story-Relevance-Action-Result, Know the Purpose- Inspire Action, Educate People, Showcase Values, Build Collaboration, Know your Audience - Educational, Social Background and Age, Developing Narratives: Characteristics of a Narrative, Data Visualization, Presenting a Word Picture, Triggering Emotions of the Audience, Choosing Media - Audio, Written, Oral and Digital Storytelling **Activity:** Analysis of Short Story: The Three Hermits by Leo Tolstoy', The Last Painting by O'Henry	4

III	**Types of Stories:** Customer Story, Origin Story, Event Story, Product Stories, Storytelling Techniques for Presentations, Using Power Words Effectively, Using Narratives to Manage Conflicts, Using a Narrative Interpret the Past and Shape the Future, Storytelling in Marketing, Story Strategies-Using Anchor Stories **Case Studies-**Brand Storytelling-Steve Jobs/Jack Maa- Product Presentation, Lido Anthony "Lee" Iacocca	4
IV	**Crafting a Story:** Crafting a Story from A Picture/an Idea/Situation/Artifacts, Storyline-Beginning/Motive/Struggle/Achievement, Six-word Story-Memoirs to Being with, Detailing Of Character and the Context, Delivering a Story–Tone / Emotions / Voice Modulation Activity- Developing and Delivering Presentation through Storytelling on the Given Situation/context	4
	Total	**15**

Lab Session	**Activities**	**Duration**
1	Basic of Storytelling: Using Five Senses in storytelling activity and Elements of Storytelling	2
2	Analysis of a Short Story: 'The Three Hermits by Leo Tolstoy', and The Last Painting by O' Henry.	2
3	Character Study: Create a detailed character profile of a fictional character, including their background, motivations, and personality traits. Write a short story or scene that showcases this character in action	2
4	Personal Storytelling: Write and present a short personal story that highlights a challenge you've faced and how you overcame it	2
5	Collaborative Storytelling: Partner with another student to create a collaborative story. Take turns writing alternating sections, focusing on maintaining a consistent tone and narrative flow.	2
6	Historical Business Story: Research and narrate a significant historical event or moment in a well-known business's journey, focusing on how storytelling played a role in shaping public perception	2
7	Social Impact Story: Develop a story that demonstrates how a business initiative or project positively impacted a community or addressed a social issue	2
8	Customer Success Story: Craft a narrative that showcases a customer's journey with your fictional business	2

9	Change Management Story: Design a narrative that communicates a change initiative within a company, addressing challenges, resistance, and the ultimate benefits of the change	2
10	Investor Pitch Story: Craft a persuasive story for a startup pitch. Highlight the problem, solution, market opportunity, and potential for growth in a captivating way	2
11	Leadership Story: Compose a story that illustrates effective leadership qualities and strategies. Highlight a leader's ability to motivate, inspire, and guide a team toward success	2
12	Cultural Storytelling: Explore how storytelling can bridge cultural gaps in a global business context. Share a story that demonstrates cultural sensitivity and understanding	2
13	Ethical Dilemma Story: Present a complex ethical dilemma faced by a business or individual. Use storytelling to explore various perspectives and potential solutions	2
14	Analysis of AI-generated stories: Analyzing an AI-generated story and adding your perspective and details to it.	2
15	Crisis Turnaround Story: Narrate a scenario where a business successfully navigated a crisis through strategic communication and storytelling, ultimately regaining trust and reputation.	2
	Total	**30**

Text Books:

1. Kendall Haven, Story Smart, Libraries Unlimited, 2014

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.

e-sources:

1. The Art of Business Storytelling | Ameen Haque | Talks at Google, https://www.youtube.com/watch?v=77FUr6ZsWjY
2. MarketingStorytelling-https://www.referralcandy.com/blog/storytelling-examples/
3. 5examplesofgreatstorytellingfromJackMahttps://www.youtube.com/watch?v=3nHOxONWfEs
4. Sixwordsstory-NicoleKahnhttps://www.youtube.com/watch?v=16sY1iLc2d4
5. KevinHart-Tellinggreatstorieshttps://www.youtube.com/watch?v=vn_L4OPU_rg

Program:	B. Tech. CSE (AI & ML)				Semester: II		
Course:	Life Skills II				Code:	BSH22CC02	
Credits	Teaching Scheme (Hrs. /Week)				Evaluation Scheme and Marks		
	Theory	Practical	Tutorial	OR	TW	PR	Total
2	-	4	-	-	100	-	100

Prior knowledge: Nil

Course Objectives:

1. To equip them with essential competencies that complement their academic education, preparing them to excel not only as engineers but also as well-balanced individuals.
2. To develop students‟ vital life skills that promotes personal growth, resilience, and success in their academic journey and beyond.

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

1. Demonstrate the ways to nurture their hobbies.
2. Apply essential skills for successful and happy life management.
3. Develop skills and a growth mindset to be successful in personal and professional life.
4. Demonstrate adaptability and flexibility for any environment.

Detailed Syllabus

Unit	Description	Duration (Hrs)
I	**Nurturing Your Hobbies and Personal Growth** **Understanding the Role of Hobbies in Personal Growth** • **Identifying Personal Interests and Hidden Talents:** Identify your interests and hidden talents by using self-assessments and exploring different hobbies. • **Creative vs. Physical Hobbies -** Finding Your Balance: Explore the differences and benefits of creative (e.g., art, music) vs physical (e.g., dance, sports) hobbies, encourage trying both types for holistic development • **Turning Hobbies into Skills and Achievements:** Build various skills from hobbies through regular practice and track your progress using a personal portfolio. • **SWOT Analysis&Reflected Best Self Exercise (RBSE)**	15
II	**Life Management** • **Digital and Global Citizenship:** Understand your role & responsibility in the global and online community. • **Social & Environmental Responsibility:** Engage in community service and eco-friendly habits to support a sustainable world. • **Diversity and Inclusion:** Practice inclusive behavior by respecting cultural, gender, and individual differences. • **Financial Literacy:** Understand the basics of managing finances in a digital economy, including online banking and e-commerce.	15
III	**Lead Yourself - Growth Mindset** • **Understanding Growth Mindset vs. Fixed Mindset:**Carol Dweck’s	15

	theory of mindset - How beliefs about intelligence and abilities influence motivation, learning habits, and confidence • **Building Resilience and Perseverance:** Understand how to bounce back from challenges and know when to keep trying or change your approach. • **Self-Leadership and Taking Initiative:** Practice taking responsibility for goals, time, and choices by setting priorities and acting independently. • **Overcoming Fear of Failure:** Recognize failure as part of the learning process and use techniques to reduce fear and build a positive attitude. • **Learning Agility:** Improve ability to adapt by learning from experience and tracking growth through regular self-review activities.	
IV	**From Procrastination to Progress: Adapting with Purpose** • **Understanding Adaptability in a Changing World:** Learn how staying open to change helps in succeeding in new roles, environments, and situations. • **Flexibility in Teamwork and Collaboration:** Practice working with different people and adapting your role based on team needs and work styles. • **Managing Time and Setting Priorities:** Build practical strategies for organizing tasks, managing schedules, and balancing academic, personal, and social commitments. • **Understanding and Overcoming Procrastination:** Identify common causes of procrastination and learn actionable techniques (e.g., habit stacking, the 5-minute rule) to build momentum	15
	Total	**60**

References Books:

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

E Sources:

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

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

Vision

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

Mission

Being a student-centric department, our mission is –

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

Vision and Mission of Computer Sciences & Engineering (AI&ML) Department

Vision

To provide value-based technical Education in Computer Science and Engineering with specialization in Artificial Intelligence and Machine Learning

Mission

M1: To develop technically competent and innovative computer science engineers with in-depth knowledge of Artificial Intelligence and Machine Learning.

M2: To build ethically responsible, knowledgeable and skilled engineers to serve the needs of industry and society at large.

M3: To provide conducive environment and opportunities for holistic development of students