

Indira Gandhi University Meerpur Rewari

(A State University established under Haryana Act No.29 of 2013)



Examination Scheme & Syllabus for

B. TECH (CSE – AI & ML)

OR

B. TECH (AI & ML)

Semester 1st & 2nd

OUTCOME BASED EDUCATION SYSTEM / LEARNING OUTCOME CURRICULUM FRAMEWORK

OBES / LOCF, CBCS CURRICULUM (w.e.f. 2026-27)

VISION AND MISSION OF THE DEPARTMENT

VISION

To train students to be highly effective instructors, researchers, developers and contributors to IT companies globally.

Be regarded as a prestigious center of scholarly achievement worldwide.

MISSION

1. To foster advance research and best education in IT domain.
2. To create skilled employees for businesses and industries based on latest IT technologies like artificial intelligence, data science and IoT etc.
3. To offer learning environment that is centered on the needs of the students in order to help in their overall development.

INDIRA GANDHI UNIVERSITY, MEERPUR, REWARI
SCHEME OF STUDIES AND EXAMINATION

Scheme effective from 2026-27
SEMESTER 1st (CSE - AI & ML)

Sr. No.	Course Code	Course Title	Hours per week			Total Contact hrs/week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L	T	P			Mark of Class work	Theory	Practical	Total	
1	BSC-PHY-103 Common with B.Tech (CSE) 1 st Semester	Physics-1	3	0	0	3	3	25	75		100	3
2	BSC-CHE-101 Common with B.Tech (CSE) 1 st Semester	Chemistry-1	3	0	0	3	3	25	75		100	3
3	BSC-MATH-103 Common with B.Tech (CSE) 1 st Semester	Mathematics-I	3	1	0	4	4	25	75		100	3
4	BSC-MATH271 Common with B.Tech (CSE) 1 st Semester	Mathematical Concepts for AI	3	1	0	4	4	25	75		100	3
5	ESC-CSE101 Common with B.Tech (CSE) 1 st Semester	Programming for Problem Solving	3	0	0	3	3	25	75		100	3
6	HSMC-ENG-101 Common with B.Tech (CSE) 1 st Semester	Communication Skills	2	0	0	2	2	25	75		100	3
7	BSC-PHY-113 Common with B.Tech (CSE) 1 st Semester	Physics Lab-1	0	0	3	3	1.5	25		25	50	3
8	BSC-CH-102 Common with B.Tech (CSE) 1 st Semester	Chemistry Lab-1	0	0	3	3	1.5	25		25	50	3
9	ESC-CSE103 Common with B.Tech (CSE) 1 st Semester	Programming in C Lab	0	0	4	4	2	25		25	50	3
10	HSMC-ENG-102 Common with B.Tech (CSE) 1 st Semester	Language Lab	0	0	2	2	1	25		25	50	3
Total Credits							25				800	

INDIRA GANDHI UNIVERSITY, MEERPUR, REWARI
SCHEME OF STUDIES AND EXAMINATION
Scheme effective from 2026-27
SEMESTER 2nd (CSE-AI & ML)

Sr. No.	Course Code	Course Title	Hours per week			Total Contact hrs/week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L	T	P			Mark of Class work	Theory	Practical	Total	
1	BSC-MATH-104 Common with B.Tech (CSE) 2 nd Semester	Mathematics-II	3	1	0	4	4	25	75		100	3
2	PCC-CSE-208 Common with B.Tech (CSE) 4 th Semester	Object Oriented Programming	3	0	0	3	3	25	75		100	3
3	PCC-CSE-203 Common with B.Tech (CSE) 3 rd Semester	Data Structures & Algorithms	3	0	0	3	3	25	75		100	3
4	PCC-CSE-202 Common with B.Tech (CSE) 4 th Semester	Discrete Mathematics	3	1	0	4	4	25	75		100	3
5	PCC-CSE-204 Common with B.Tech (CSE) 4 th Semester	Computer Organization & Architecture	3	0	0	3	3	25	75		100	3
6	LC-CSE-214 Common with B.Tech (CSE) 4 th Semester	Object Oriented Programming Lab using C++	0	0	4	4	2	25		25	50	3
7	LC-CSE-213 Common with B.Tech (CSE) 3 rd Semester	Data Structures & Algorithms LAB Using C	0	0	4	4	2	25		25	50	3
8	HS150	Design Thinking Lab	0	0	2	2	1	25		25	50	3
9	HSMC(H-102)	Universal Human Values-II: Understanding Harmony and Ethical Human Conduct	2	0	0	2			50			
Total Credits							22				650	

HSMC(H-102) is a mandatory non –credit course in which the students will be required passing marks in theory.

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Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

SEMESTER – I

Course code	BSC-PHY-103				
Category	Basic Science Course				
Course title	Semiconductor Physics				
Credits	L	T	P	Credits	Semester-I
	3	0	0	3	
Branches (B. Tech.)	• Computer Science Engineering • Information Technology • Computer Science and Information Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Objectives of the course:

- To impart the concepts of Semiconductors.
- To understand Intrinsic and extrinsic semiconductors.
- To create dynamic applications in Optical transitions in bulk semiconductors.
- To implement Four-point probe and Vander Pauw measurements for carrier density.

Prerequisite: “Introduction to Quantum Mechanics” Desirable

UNIT - I

Electronic Materials: Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirect band gaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass, Phonons.

UNIT - II

Semiconductors: Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport:diffusion and drift-p-n junction, Metal-semiconductor junction(Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices.

UNIT – III

Light-Semiconductor Interaction

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; Joint density of states, Density of states for photons, Transition rates(Fermi's golden rule), Optical loss and gain; Photovoltaic effect, Exciton, Drude model.

UNIT - IV

Measurements & Engineered Semiconductor Materials

Four-point probe and vander Pauw measurements for carrier density, resistivity, and hall mobility; Hot-point probe measurement, capacitance-voltage measurements, parameter extraction from diode I-V characteristics, DLTS, band gap by UV-Vis spectroscopy, absorption/transmission. Density of states in 2D, 1D and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, and characterization techniques. Hetero junctions and associated band-diagram.

Course Outcomes:

- CO1 To introduce the concept of metals, semiconductors and insulators.
- CO2 To describe Energy bands in solids.
- CO3 To apply the concept of Intrinsic and extrinsic semiconductors.
- CO4 To impart knowledge of optoelectronic devices.
- CO5 To know about Density of states for photons.
- CO6 To instruct about Optical loss and gain.
- CO7 To explain the mechanism of Hot-point probe measurement.
- CO8 Gained knowledge about Hetero junctions and associated band-diagram.

Mapping of Paper No. BSC-PHY-103

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	S	S	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO3	M	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	M	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO7	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S
CO8	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S

S=Strong M=Medium W=Weak

References:

1. Pierret, Semiconductor Device Fundamental,

2. P. Bhattacharya, Semiconductor Optoelectronic Devices, Pearson Education
3. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc.
4. B.E.A.Saleh and M.C.Teich, Fundamentals of Photonics, John Wiley & Sons, Inc.
5. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley
6. A.Yariv and P.Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York.
7. Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL
8. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL

Course code	BSC-CHE-101				
Category	Basic Science Course				
Course title	Chemistry I (Theory)				
Scheme and Credits	L	T	P	Credits	Semester-I
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Objectives of the course:

- To impart the basic concepts of Atomic and molecular structure.
- To understand Stereo chemistry
- To create dynamic applications in Synthesis of commonly used drug molecules.
- To implement Spectroscopic techniques

UNIT-I

Atomic and molecular structure: Schrodinger equation (Introduction and concept only). Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations (derivation excluded). Molecular orbital energy level diagrams of diatomic molecules. Pi-molecular orbitals of butadiene and benzene. Crystal field theory and the energy level diagrams for transition metal ions. Band structure of solids and the role of doping on band structures. **Periodic properties:** Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states.

UNIT-II

Stereochemistry: Representations of 3 dimensional structures, structural isomers and stereo isomers, configurations, symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal Compounds. **Organic reactions and synthesis of a drug molecule:** Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization (mechanism excluded). Synthesis of commonly used drug molecules (Aspirin & Paracetamol).

UNIT-III

Intermolecular forces: Ionic, dipolar and Van der Waals interactions. Equations of state of real gases and critical phenomena. **Water Chemistry and Corrosion:** Hardness of water- Introduction, Types, Measurement of hardness by EDTA method, Methods of water softening (Lime soda process, Zeolite Process, Demineralization process). Corrosion: Introduction, Types, Factor affecting corrosion and methods of prevention.

UNIT-IV

Spectroscopic techniques and applications: Basic concept of spectroscopy, Principle and Applications of different spectroscopic techniques (UV-Visible and IR spectroscopy). Nuclear magnetic resonance and magnetic resonance imaging, Elementary discussion on Flame photometry.

Course Outcomes:

- CO1 To introduce the concept of Schrodinger equation.
- CO2 To describe the energy level diagrams for transition metal ions.
- CO3 To apply the concept of stereo isomers.
- CO4 To impart knowledge of Isomerism in transitional metal
- CO5 To know about the Synthesis of commonly used drug molecules.
- CO6 To instruct about Spectroscopic techniques.
- CO7 To explain the EDTA method.
- CO8 Gained knowledge about Water Chemistry and Corrosion.

Mapping of Paper No. BSC-CHE-101

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	S	S	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO3	M	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	M	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO7	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S
CO8	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S

S=Strong M=Medium W=Weak

Suggested Text Books:

1. University Chemistry, Bruce M. Mahan, Pearson Education.
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
3. Essentials of Analytical Chemistry, Shobha Ramakrishnan and Banani Mukhopadhyay, Pearson Education.
4. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
5. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
6. Physical Chemistry, by P. W. Atkins

Course code	BSC-MATH-103					
Category	Basic Science Course					
Course title	Math-I (Calculus and Linear Algebra)					
Scheme and Credits	L	T	P	Credits	Semester-I	
	3	1	0	4		
Class work	25 Marks					
Exam	75 Marks					
Total	100 Marks					
Duration of Exam	03 Hours					

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Objectives of the course:

- To impart the basic concepts of Calculus.
- To understand Gauss elimination and Gauss-Jordan elimination.
- To create dynamic applications in Calculus.
- To implement Gram-Schmidt orthogonalization.

Unit-I

Calculus: Indeterminate forms and L'Hospital's rule, Maxima and Minima, Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders, Evolutes and Involute, Evaluation of definite and improper integrals, Applications of definite integrals to evaluate surface areas and volumes of revolutions, Beta and Gamma functions and their properties.

Unit-II

Matrices: Matrices, Vectors: addition and scalar multiplication, Matrix multiplication, Linear systems of equations, Linear Independence, Rank of a matrix, Determinants, Cramer's Rule, Inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

Unit-III

Vector spaces I: Vector Space, Linear dependence of vectors, Basis, Dimension, Linear transformations (maps), Range and kernel of a linear map, Rank and nullity, Inverse of a linear transformation, Rank nullity theorem, Matrix associated with a linear map, Composition of linear maps.

Unit-IV

Vector spaces II: Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric and Orthogonal Matrices, Eigenbases, Diagonalization, Inner product spaces, Gram-Schmidt orthogonalization.

Course Outcomes:

- CO1 To introduce the concept of L'Hospital's rule .
- CO2 To describe the Beta and Gamma functions and their properties.
- CO3 To apply the concept of Linear dependence of vectors.
- CO4 To impart knowledge of Gauss elimination and Gauss-Jordan elimination.
- CO5 To know about the Eigenvalues, Eigenvectors.
- CO6 To instruct about the Cramer's Rule.
- CO7 To explain the Gram-Schmidt orthogonalization.
- CO8 Gained knowledge about vectors and calculus.

Mapping of Paper No. BSC-MATH-103.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	S	S	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO3	M	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	M	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO7	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S
CO8	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S

S=Strong M=Medium W=Weak

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson Education.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. D. Poole, Linear Algebra: A Modern Introduction, Brooks Cole.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
7. V. Krishnamurthy, V.P. Mainra and J. L. Arora, An introduction to Linear Algebra, Affiliated East-West Press Private limited.
8. Seymour Lipschutz and Marc Lipson, Linear algebra, Schaum's Outline, Tata McGraw-Hill Publishing Company Limited.

Course code	BSC-MATH-271				
Category	Basic Science Course				
Course title	Mathematical Concepts for AI				
Scheme and Credits	L	T	P	Credits	Semester-I
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have questions from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Objective of the Course

1. Introduce the fundamental mathematical concepts required for Artificial Intelligence and Machine Learning, including linear algebra, calculus.
2. Develop mathematical skills for AI applications by understanding data representation, feature spaces, dimensionality reduction, and matrix-based computations.
3. Provide knowledge of optimization techniques used in AI model development, including gradient-based methods and numerical optimization approaches.
4. Build a strong mathematical foundation that supports advanced topics in Artificial Intelligence, Machine Learning, Deep Learning, and Data Science.

Unit I

Equations, Functions and Graphs: Introduction to linear equations, Intercepts and slopes, System of equations, Exponentials, radicals and logarithms, Polynomials, Polynomial operations, Factorizations, Introduction to quadratic equations, Functions.

Unit II

Derivatives and Optimizations: Rate of change, Introduction to limits, Continuity, finding limits, Differentiability, Derivative rules and operations, using derivatives to analyse functions, Second order derivatives, Optimization functions, Multivariate differentiation, applications of optimization in machine learning model training.

Unit III

Data Representation and Information Theory for AI: Data representation in AI, feature vectors and feature spaces, distance measures and similarity measures, normalization and standardization of data, entropy and information gain, mutual information, dimensionality reduction concepts, principal component analysis (PCA), singular value decomposition (SVD), applications of data representation techniques in Artificial Intelligence and Machine Learning.

Unit IV

Sequences and Series: Limit of a sequence, monotone and Cauchy sequences and properties of convergent sequences, examples. Infinite series, positive series, tests for convergence and divergence, integral test, alternating series, Leibnitz test.

Course Outcomes

After completion of the course the student will be able:

CO1: Apply the concepts of equations, functions.

CO2: Apply differential calculus and optimization techniques such as gradient descent and Newton's method to solve mathematical optimization problems involved in AI and Machine Learning models.

CO3: Analyze and implement mathematical techniques for data representation, feature extraction, dimensionality reduction, and information processing using methods such as PCA and SVD.

CO4: Understand the behavior of series and their applications.

Mapping of Paper No. BSC-MATH-271

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	S	S	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO3	M	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S

S=Strong M=Medium W=Weak

Suggested Reference Books

1. Advanced Engineering Mathematics, Reena Garg, Khanna Book Publishing Co., Delhi
2. Advanced Engineering Mathematics, Wylie and Barrett, McGraw Hill, 1995
3. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons.
4. B.V. Ramana, *Higher Engineering Mathematics*, Tata McGraw-Hill Publishing Company Limited.
5. N. P. Bali and Manish Goyal, *A Text Book of Engineering Mathematics*, Laxmi Publications.
6. Krishnaiah, P. R., & Rao, C. R. (Eds.). (1988). *Handbook of statistics: Computer science and statistics*. Elsevier.
7. S. L. Ross, *Differential Equations*, Wiley India

Course code	ESC-CSE-101				
Category	Basic Science Course				
Course title	Programming for Problem Solving				
Scheme and Credits	L	T	P	Credits	Semester-I
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Objectives of the course:

- To impart the basic concepts of Programming.
- To understand C Programming.
- To create dynamic applications in C Programming.
- To implement Array of Structures, File Handling.

Unit 1

Introduction to Programming: Idea of Algorithm: Steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.

C Programming: Keywords, Variables and Data Types: basic, derived and user defined, Type Conversions, Header Files, Basic Input and Output Functions and Statements, Compilation, Syntax and Logical Errors in compilation, Object and Executable Code, Storage Classes, Arithmetic Expressions and Precedence.

Unit 2

Preprocessors, Conditional and Branching Statements, Loops/ Iterative Statements, Writing and evaluation of conditionals and consequent branching.

Unit 3

Arrays (1-D, 2-D), Character Arrays and Strings, Arrays with Pointers, Functions (including using built in libraries), Parameter passing in functions, Call by Value, Call by Reference, Passing arrays to functions, Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc.

Unit 4

Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, Introduction to Dynamic Memory Allocation and its Methods, Structures, Union, Defining Structures and Array of Structures, File Handling.

Course Outcomes:

- CO1 To formulate simple algorithms for arithmetic and logical problems.
 CO2 To translate the algorithms to programs (in C language).
 CO3 To test and execute the programs and correct syntax and logical errors.
 CO4 To implement conditional ranching, iteration and recursion.
 CO5 To decompose a problem into functions.
 CO6 To use arrays, pointers and structures to formulate algorithms and programs.
 CO7 To apply programming to solve matrix addition and multiplication problems
 CO8 To apply programming to solve simple numerical method problems, namely differentiation of function and simple integration.

Mapping of Paper No. ESC-CSE-101

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	S	S	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO3	M	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	M	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO7	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S
CO8	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S

S=Strong M=Medium W=Weak

Suggested Text Books:

1. Ajay Mittal, Programming in C, 'A Practical Approach', Pearson Education.
2. Satinder Bal Gupta & Amit Singla, Fundamental of Computers and Programming in C, Shree Mahavir Book (Publishers), New Delhi
3. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
4. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
5. Yashavant Kanetkar, Let Us C, BPB Publication.
6. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Course code	HSMC-ENG-101				
Category	Humanities Course				
Course title	English Language Skills				
Scheme and Credits	L	T	P	Credits	Semester-I
	2	0	0	2	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Objectives of the course:

- To impart English Language Skills.
- To understand Phonetics.
- To improve Reading and Writing Practices

UNIT - I

Basic Writing skills: Subject Verb Agreement, Noun Pronoun Agreement, Governance of Nouns through Prepositions, Basic Verb Patterns (V, SV, SVO, SVOO, SVC, SVOC, SVOA)

UNIT - II

Vocabulary Building& Creating Grammatical Cohesion: One word substitution, Phrasal Verbs, Commonly used Idioms, Foreign words, Referring Time in Language (Tenses), Use of Active and Passive Voice

UNIT - III

Phonetics: Basic concept –Vowels, Consonants, Phonemes, Syllable, Transcription of words

UNIT - IV

Reading and Writing Practices

(a) Literary Texts:

- “Patriotism beyond politics and Religion’ by Abdul Kalam Azad
- “The Secret of Work” by Swami Vivekananda
- “An Outline of Intellectual Rubbish” by Bertrand Russell
- “Mother Teresa” by Khushwant Singh

(b) Writing official Letters- Issues Concerning Students’ academic and social life

(c) Essay Writing

(d) Paragraph Writing

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Course Outcomes:

- CO1 To introduce the concept of English Language Skills.
- CO2 To describe the Basic Verb Patterns (V, SV, SVO, SVOO, SVC, SVOC, SVOA)
- CO3 To apply the concept of Phonetics.
- CO4 To impart knowledge of Active and Passive Voice.
- CO5 To know about the English grammar.
- CO6 To instruct about the Reading and Writing.
- CO7 To explain the Phonetics.
- CO8 Gained knowledge about English language.

Mapping of Paper No. HSMC-ENG-101

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	S	S	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO3	M	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	M	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO7	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S
CO8	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S

S=Strong M=Medium W=Weak

Recommended Readings:

1. Nitin Bhatnagar and Mamta Bhatnagar, Communicative English for Engineers and Professionals. Pearson Education.
2. Bhatnagar, k. Manmohan.Ed. The Spectrum of Life: An Anthology of Modern Prose.Delhi: Macmillan India Ltd., 2006.
3. C. Murlikrishna& Sunita Mishra, Communication Skills for Engineers, Pearson Ed.
4. Sinha, R.P.Current English Grammar and Usage. OUP.
5. Rizvi, M. Ashraf.Effective Technical Communication. McGraw Hill Education (India)Pvt. Ltd., 2014.
6. Eastwood, John.Oxford Guide to English Grammar.OUP, 2010.
7. Kumar, Sanjay and PushpLata. Communication Skills. OUP, 2011.

Course code	BSC-PHY-113				
Category	Basic Science Course				
Course title	Semiconductor Physics Lab				
Scheme and Credits	L	T	P	Credits	Semester-I
	0	0	3	1.5	
Branches (B. Tech.)	• Computer Science Engineering • Information Technology • Computer Science and Information Technology				
Internal Practical	25 Marks				
External Practical	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Note: Students will be required to learn to take readings of vernier caliper, screw gauge, spherometer, spectrometer etc. during their orientation labs at the starting and **will have to perform at least ten subject related experiments in a semester.**

Basic experiments on least count and error estimation (during orientation)

- To aware about the least count of vernier caliper and screw gauge and to find the thickness of a slide using vernier caliper and diameter of wire using screw gauge.
- Calculation of radius of curvature of a convex surface using spherometer.
- Angel measurement using spectrometer.

Objectives of the course:

- To impart the basic P-N junction diode.
- To understand Semiconductors.
- To create dynamic applications in Solar cell.
- To study the reverse characteristics of Zener diode.

List of Subject related Experiments:

1. To study the forward and reverse characteristics of P-N junction diode.
2. To study the characteristics of transistor in common base configuration.
3. To study the characteristics of transistor in common emitter configuration.
4. To study the characteristics of Junction field effect (JFET) transistor.
5. To study the characteristics of Metal oxide semiconductor field effect (MOSFET) transistor.
6. To study the characteristics of Solar cell and find out the fill factor.
7. To design and study Active and Passive filters.
8. To study the reverse characteristics of Zener diode and voltage regulation using Zener Diode.
9. To determine Planks constant using photocell.
10. To measure e/m of electron using helical method.
11. To find capacitance of condenser using fleshing and quenching experiment.

12. To find temperature co-efficient of platinum using Callender Griffith bridge.
13. To find out low resistance by Carry Foster bridge.
14. To find resistance of galvanometer by post office box.
15. To compare the capacitance of two capacitors using De'Sauty Bridge.

Course Outcomes:

- CO1 To introduce the concept of P-N junction diode.
 CO2 To describe the Active and Passive filters.
 CO3 To apply the concept of Planks constant.
 CO4 To impart knowledge of fleshing and quenching experiment.
 CO5 To know about the Metal oxide semiconductor field effect (MOSFET) transistor.
 CO6 To instruct about the galvanometer.
 CO7 To explain the mechanism of Carry Foster bridge.
 CO8 Gained knowledge about Semiconductors.

Mapping of Paper No. BSC-PHY-113

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	S	S	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO3	M	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	M	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO7	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S
CO8	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S

S=Strong M=Medium W=Weak

Course code	BSC-CHE-102					
Category	Basic Science Course					
Course title	Chemistry I (Practical)					
Scheme and Credits	L	T	P	Credits	Semester-I	
	0	0	3	1.5		
Internal Practical	25 Marks					
External Practical	25 Marks					
Total	50 Marks					
Duration of Exam	03 Hours					

Objectives of the course:

- To impart the basic surface tension.
- To understand urea formaldehyde and phenol formaldehyde resin.
- To create dynamic applications in Paperchromatography.
- To implement EDTA method.

LIST OF EXPERIMENTS: -

1. Determination of surface tension of given liquid by drop number method.
2. Determine the viscosity of given liquid by using Ostwald's viscometer / Redwood viscometer.
3. Calculate the R_f value of given sample using Thin layer chromatography / Paper chromatography.
4. Removal of Ca²⁺ and Mg²⁺ hardness from given water sample using ion exchange column.
5. Determination of chloride content in given water sample.
6. Calculate the strength of strong acid by titrating it with strong base using conductometer.
7. Calculate the emf value of given cell.
8. To prepare the of urea formaldehyde and phenol formaldehyde resin.
9. To determine the rate constant of a reaction.
10. To Prepare iodoform.
11. Calculate the saponification value / acid value of given oil sample.
12. Chemical analysis of two anions and two cations in given sample of salt.
13. Determination of the partition coefficient of a substance between two immiscible liquids.
14. To determine the total hardness of given water sample by EDTA method.
15. Study the adsorption phenomena using acetic acid and charcoal.

16. Lattice structures and packing of spheres.

Note: At least 10 experiments are to be performed by the students.

1. Each laboratory class/section shall not be more than about 20 students.
2. To allow fair opportunity of practical hands on experience to each student, each experiment may either be done by each student individually or in group of not more than 3-4 students. Larger groups are strictly discouraged/disallowed.
3. Pre-experimental & post experimental quiz/questions may be offered for each lab experiment to reinforce & aid comprehension of the experiment.

Course Outcomes:

CO1 To introduce the concept of surface tension.

CO2 To describe the Paper chromatography.

CO3 To apply the concept of viscosity.

CO4 To impart knowledge of EDTA method.

CO5 To know about the adsorption phenomena.

CO6 To instruct about the redox potentials.

CO7 To explain the mechanism of Redwood viscometer.

CO8 Gained knowledge about saponification.

Mapping of Paper No. BSC-CHE-102

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	S	S	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO3	M	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	M	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO7	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S
CO8	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S

S=Strong M=Medium W=Weak

Suggested Books:

1. A Text book on Experiments and Calculation –Engineering Chemistry by S.S.Dara, S. Chand & Company Ltd.
2. Essentials of Analytical Chemisty, Shobha Ramakrishnan, Pearson Education.
3. Essential of Experimental Engineering chemistry, Shashi Chawla, Dhanpat Rai Publishing Co.
4. Theory & Practice Applied Chemistry – O.P.Virmani, A.K. Narula (New Age).
5. Engineering Chemistry, K.SeshaMaheswaramma and MridulaChugh, PearsonEducation.

Course code	ESC-CSE-103					
Category	Engineering Science Course					
Course title	Programming in C Lab					
Scheme and Credits	L	T	P	Credits	Semester-I	
	0	0	4	2		
Internal Practical	25 Marks					
External Practical	25 Marks					
Total	50 Marks					
Duration of Exam	03 Hours					

Objectives of the course:

- To impart the basic concepts of C Programming.
- To understand Branching and logical expressions .
- To create dynamic applications in C Programming.
- To implement C Programming.

Tutorial 1: Problem solving using computers:

Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:

Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:

Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:

Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays

Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings

Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:

Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):

Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls

Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation

Lab 11: Pointers and structures

Tutorial 12: File handling:

Lab 12: File operations: To be able to create, read and write to and from simple text files.

Course Outcomes:

CO1 To formulate the algorithms for simple problems

CO2 To translate given algorithms to a working and correct program

CO3 To be able to correct syntax errors as reported by the compilers

CO4 To be able to identify and correct logical errors encountered at run time

CO5 To be able to write iterative as well as recursive programs

CO6 To be able to represent data in arrays, strings and structures and manipulate them through a program

CO7 To be able to declare pointers of different types and use them in defining self-referential structures.

CO8 To be able to create, read and write to and from simple text files.

Mapping of Paper No. ESC-CSE-103

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	S	S	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO3	M	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	M	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO7	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S
CO8	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S

S=Strong M=Medium W=Weak

Course code	HSMC-ENG-102				
Category	Humanities Course				
Course title	English Language Lab				
Scheme and Credits	L	T	P	Credits	Semester-I
	0	0	2	1	
Internal Practical	25 Marks				
External Practical	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Course Objective:

The course aims at developing the desired English language skills of students of Engineering and Technology so that they become proficient in communication to excel in their professional lives. The course has been so designed as to enhance their linguistic and communicative competence.

Course Contents:

- Listening comprehension
- Recognition of phonemes in International Phonetic Alphabet
- Self-introduction and introduction of another person
- Conversation and dialogues in common everyday situations
- Communication at work place (Standard phrases and sentences in various situations)
- Telephonic communication
- Speeches for special occasions (Welcome speeches, Introduction speeches, Felicitation speeches and Farewell speeches)
- Tag Questions
- Formal Presentations on literary texts prescribed in theory paper

Note: Three-hour time to each segment is recommended for instruction and practice. Scheme of End Semester Practical Exam:

- A small passage may be read out to the examinees and they will have to write the answers to the questions asked at the end of the passage.
- Questions will be short answer type.
- Examinees may be asked to identify the sounds of phonemes in given words.
- Examinees may be asked to introduce themselves or others, participate in role play activities in mock situations, give short responses, engage in hypothetical telephonic conversation or supply the tag questions to statements etc.
- Examinees may also be asked to deliver speeches on given situations or make presentation on the literary texts prescribed in Unit IV of theory paper.

Course Outcomes:

- CO1 To introduce the concept of Listening comprehension
 CO2 To acquire basic proficiency in English .
 CO3 To apply the speaking skills both at social and professional platforms.
 CO4 To impart knowledge of Conversation and dialogues in common everyday situations
 CO5 To know about the Speeches for special occasions.
 CO6 To instruct about the Communication at work place.
 CO7 To explain the Telephonic communication.
 CO8 Gained knowledge about English communication skills.

Mapping of Paper No. HSMC-ENG-102

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	S	S	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO3	M	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	M	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO7	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S
CO8	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S

S=Strong M=Medium W=Weak

Recommended Readings:

1. Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson Education, 2013.
2. Swan, Michael. Practical English Usage. OUP, 1995.
3. Gangal, J.K. Practical Course in Spoken English. New Delhi: PHI Learning, 2015.
4. Konar, Nira. Communication Skills for Professionals. New Delhi: PHI Learning Pvt. Ltd., 2009.
5. Bansal, R.K. and J.B. Harrison. Spoken English. Orient Longman, 1983.
6. Sharma, Sangeeta and Binod Mishra. Communication Skills for Engineers and Scientists. Delhi: PHI Learning Pvt. Ltd., 2015.

SEMESTER – II

Course code	BSC-MATH-104				
Category	Basic Science Course				
Course title	Math-II (Probability and Statistics)				
Scheme and Credits	L	T	P	Credits	Semester-II
	3	1	0	4	
Branches (B. Tech.)	• Information Technology • Computer Science Engineering • Computer Science and Information Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Objectives of the course:

- To impart the basic concepts of Probability and Statistics .
- To understand Applied Statistics
- To create dynamic applications in Probability and Statistics .
- To implement Correlation and regression.

Unit-I

Random variables and discrete probability distributions: Conditional probability, Probability spaces, Discrete random variables, Independent random variables, Expectation of discrete random variables, Sums of independent random variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality, The multinomial distribution, Poisson approximation to the binomial distribution, Infinite sequences of Bernoulli trials.

Unit-II

Continuous and Bivariate probability distribution: Continuous random variables and their properties, Distribution functions and densities, Normal, Exponential and Gamma densities, Bivariate distributions and their properties, Distribution of sums and quotients, Conditional densities, Bayes' rule.

Unit-III

Basic Statistics: Measures of Central tendency: Moments, Skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions; Correlation and regression – Rank correlation; Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.

Unit-IV

Applied Statistics: Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations; Small samples: Test for single mean, difference of means and correlation coefficients; Test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Course Outcomes:

- CO1 To introduce the concept of Probability and Statistics.
- CO2 To describe the Chebyshev's Inequality.
- CO3 To apply the concept of Normal, Exponential and Gamma densities.
- CO4 To impart knowledge of Probability distributions.
- CO5 To know about the Measures of Central tendency: Moments, Skewness and Kurtosis.
- CO6 To instruct about the Curve fitting.
- CO7 To explain the means and correlation coefficients.
- CO8 Gained knowledge about Probability and Statistics

Mapping of Paper No. BSC-MATH-104

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	S	S	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO3	M	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	M	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO7	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S
CO8	S	S	S	M	S	S	M	S	S	S	S	S	S	S	S

S=Strong M=Medium W=Weak

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall.
3. S. Ross, A First Course in Probability, Pearson Education.
4. W. Feller, An Introduction to Probability Theory and its Applications, Wiley.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

Course code	PCC-CSE-208				
Category	Professional Core Course				
Course title	Object Oriented Programming				
Scheme and Credits	L	T	P	Credits	Semester- II
	3	0	0	3	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Objectives of the course:

To expose the students to the following:

- How Object-Oriented Programming Concepts works.
- Creating class objects, accessing class members.
- Concept of binding - early binding and late binding.

Unit - I

Object-Oriented Programming Concepts: Introduction, comparison between procedural programming paradigm and object-oriented programming paradigm, basic concepts of object-oriented programming — concepts of an object and a class, interface and implementation of a class, operations on objects, relationship among objects, abstraction, encapsulation, data hiding, inheritance, overloading, polymorphism, messaging.

Classes and Objects: Specifying a class, creating class objects, accessing class members, access specifiers, static members, use of const keyword, friends of a class, empty classes, nested classes, local classes, abstract classes, container classes, bit fields and classes.

Unit - II

Inheritance: Introduction, defining derived classes, forms of inheritance, ambiguity in multiple and multipath inheritance, virtual base class, object slicing, overriding member functions, object composition and delegation, order of execution of constructors and destructors.

Pointers and Dynamic Memory Management: Declaring and initializing pointers, accessing data through pointers, pointer arithmetic, memory allocation (static and dynamic), dynamic memory management using new and delete operators, pointer to an object, this pointer, pointer related problems - dangling/wild pointers, null pointer assignment, memory leak and allocation failures.

Unit - III

Constructors and Destructors: Need for constructors and destructors, copy constructor, dynamic constructors, explicit constructors, destructors, constructors and destructors with static members, initializer lists.

Operator Overloading and Type Conversion: Overloading operators, rules for overloading operators, overloading of various operators, type conversion - basic type to class type, class type to basic type, class type to another class type.

Virtual functions & Polymorphism: Concept of binding - early binding and late binding, virtual functions, pure virtual functions, abstract classes, virtual destructors.

Unit - IV

Exception Handling: Review of traditional error handling, basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, rethrowing an exception, specifying exceptions.

Templates and Generic Programming: Template concepts, Function templates, class templates, illustrative examples.

Course Outcomes:

- CO1 To introduce the concept of interface and implementation of a class.
- CO2 To describe the nested classes, local classes, abstract classes.
- CO3 To apply the concept of ambiguity in multiple and multipath inheritance.
- CO4 To impart knowledge of accessing data through pointers.
- CO5 To know about the copy constructor, dynamic constructors.
- CO6 To instruct about the basic type to class type, class type to basic type.
- CO7 To explain the mechanism of, basics of exception handling.
- CO8 Gained a knowledge about Function templates, class templates.

Mapping of Paper No – PCC-CSE-206

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO3	S	S	S	S	S	S	S	M	S	S	S	S	S	M	S
CO4	M	S	S	S	S	S	S	S	S	S	S	S	S	M	S
CO5	S	S	S	S	S	M	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO7	S	S	S	S	S	S	M	S	S	S	M	S	S	S	S
CO8	S	S	M	S	S	S	S	S	S	S	M	S	S	S	S

S=Strong M=Medium W=Weak

TEXT BOOKS, AND/OR REFERENCE MATERIAL:

1. Bjrane Stroustrup, “C++ Programming language”,3rd edition, Pearson education Asia(1997)
2. Object-Oriented Programming in C++, by Shukla, Wiley India Ltd.
3. LaforeR.”Object oriented Programming in C++”, 4th Ed. Tech media, New Delhi (2002).
4. Yashwant Kenetkar,” Let us C++”,1stEd.,Oxford University Press(2006)

Course code	PCC-CSE-203				
Category	Professional Core Course				
Course title	Data Structure & Algorithms				
Scheme and Credits	L	T	P	Credits	Semester- II
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Objectives of the course:

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures

Unit 1:

Introduction: Basic Terminologies: Concept of Data Structure, Choice of right Data Structure, Algorithms, how to design and develop algorithm, Complexity of algorithm. Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.

Unit 2:

Stacks and Queues: Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation -corresponding algorithms and complexity analysis. Queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

Unit 3:

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular LinkedLists: all operations their algorithms and the complexity analysis.

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with Complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

Unit 4:

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Selection Sort Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Course Outcomes:

CO1 To introduce the concept of Choice of right Data Structure, Algorithms.

CO2 To describe the factors Linear Search and Binary Search Techniques.

CO3 To apply the concept Algorithms and their complexity analysis.

CO4 To impart knowledge of Priority Queue; Operations on each type of Queues.

CO5 To know about the operations their algorithms and the complexity analysis.

CO6 To instruct about the Applications of Binary Trees.

CO7 To explain the mechanism Selection Sort, Bubble Sort.

CO8 Gained knowledge about traversal algorithms and complexity analysis.

Mapping of Paper No – PCC-CSE-203

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	M	M	S	S	S	S	S	S	S	M
CO3	M	S	S	M	S	S	S	M	S	M	S	S	S	S	S
CO4	S	S	S	M	M	S	S	M	S	M	S	S	S	S	S
CO5	S	S	S	S	S	M	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	M	M	S	S	S	S	S	S	S	M
CO7	S	M	S	S	S	S	S	S	S	S	M	S	S	S	S
CO8	S	M	S	S	S	S	S	S	S	S	M	S	S	S	S

S=Strong M=Medium W=Weak

Suggested reference books:

1. Data Structures using C & C++: by Shukla, Wiley India Ltd.
2. “Fundamentals of Data Structures”, Illustrated Edition by Ellis Horowitz, Sartaj Sahni, and Computer Science Press.
3. Data Structures, 2ed by Venkatesan, Wiley India Ltd.
4. Algorithms, Data Structures, and Problem Solving with C++”, Illustrated Edition by MarkAllen Weiss, Addison-Wesley Publishing Company
5. Data Structures & Algorithms in Java, 6ed by Goodrich, Wiley India Ltd.
6. “How to Solve it by Computer”, 2nd Impression by R.G. Dromey, Pearson Education.
7. C & Data Structures by Deshpande, Wiley India Ltd.

Course code	PCC-CSE-202				
Category	Professional Core Course				
Course title	Discrete Mathematics				
Scheme and Credits	L	T	P	Credits	Semester - II
	3	1	0	4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Objectives of the course:

- To impart the basic concepts of Sets, Relation, Function and Propositional Logic
- To understand Basic Counting Techniques and Recurrence Relation
- To Understand Definitions and examples of Algebraic Structures with one Binary Operation.
- To implement Graphs and their properties, Degree, Connectivity.

Unit-I

Sets, Relation, Function and Propositional Logic: Operations and Laws of Sets, Cartesian Products, Representation of relations, Binary Relation, Equivalence Relation, Partial Ordering Relation, POSET, Hasse Diagram, Lattices and its types, Function, Bijective functions, Inverse and Composite Function, Finite and infinite Sets, Countable and Uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem, Propositions, Logical operations, Conditional Statements, Tautologies, Contradictions, Logical Equivalence, The use of Quantifiers

Unit-II

Basic Counting Techniques and Recurrence Relation: Pigeon-hole principle, Permutation and Combination, the Division algorithm: Prime Numbers, The GCD: Euclidean Algorithm, The Fundamental Theorem of Arithmetic., Linear recurrence relation with constant coefficients, Homogenous Solutions, Particular Solutions, Total Solutions, Solving recurrence relation using generating functions

Unit-III

Algebraic Structures: Definitions and examples of Algebraic Structures with one Binary Operation: Semi Groups, Monoids, Groups; Congruence Relation and Quotient Structures, Permutation Groups, Cyclic groups, Normal Subgroups, Definitions and examples of Algebraic Structures with two Binary Operation: Rings, Integral Domain, Fields; Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

Unit-IV

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Bi- connected component and Articulation Points, Isomorphism, Multigraph and Weighted graph, Shortest path in Weighted graphs, Eulerian paths and circuits, Hamiltonian path and circuits, Planar Graphs, Euler's formulae, Graph Colouring, Trees, Binary trees and its traversals, Trees Sorting, Spanning tree, Minimal Spanning tree

Course Outcomes:

- CO1 To understand the concept of Partial Ordering Relation, POSET, Lattices and its types.
- CO2 To describe the factors Contradictions, Logical Equivalence, The use of Quantifiers.
- CO3 To apply the concept of , Permutation and Combination, the Division algorithm.
- CO4 To impart knowledge of Homogenous Solutions, Particular Solutions, Total Solutions.
- CO5 To know about the Structures with one Binary Operation.
- CO6 To instruct about the Boolean Function, Disjunctive and Conjunctive Normal Form.
- CO7 To explain the mechanism of Connectivity, Path, Cycle, Sub Graph.
- CO8 Gained a knowledge about Planar Graphs, Euler's formulae, Graph Colouring,

Mapping of Paper No – PCC-CSE-202

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S	S	S	M	S	S	S	S	M	S	S	S
CO2	S	M	S	S	S	M	S	S	S	S	S	S	S	S	M
CO3	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S	S	S	S	M	S
CO5	S	S	S	S	S	M	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M
CO7	M	S	S	S	S	S	M	S	S	S	M	S	S	S	S
CO8	S	S	S	M	S	S	S	S	S	S	M	S	S	S	S

S=Strong M=Medium W=Weak

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Satinder Bal Gupta: A Text Book of Discrete Mathematics and Structures, University Science Press, Delhi.
3. C. L. Liu and D. P. Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, Tata McGraw – Hill.
4. J.P. Tremblay and R. Manohar, Discrete mathematical structures with applications to computer science, TMG Edition, Tata McGraw-Hill
5. Discrete Mathematics, Seymour Lipschutz and Marc Lipson, Schaum's outline

Course code	PCC-CSE-204				
Category	Professional Core Course				
Course title	Computer Organization & Architecture				
Scheme and Credits	L	T	P	Credits	Semester-II
	3	0	0	3	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Objectives of the course:

To expose the students to the following:

- How Computer Systems work & the basic principles
- Instruction Level Architecture and Instruction Execution
- The current state of art in memory system design
- How I/O devices are accessed and its principles.
- To provide the knowledge on Instruction Level Parallelism
- To impart the knowledge on micro programming
- Concepts of advanced pipelining techniques.

Unit 1

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU—registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction set of some common CPUs.

Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

Unit 2

Introduction to x86 architecture. **CPU control unit design:** hardwired and micro-programmed design approaches, Case study –design of a simple hypothetical CPU. **Memory system design:** semiconductor memory technologies, memory organization.

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers—program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes—role of interrupts in process state transitions, I/O device interfaces – SCII, USB

Unit 3

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

Unit 4

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

Course Outcomes:

- CO1 Learned the concept of RTL interpretation of instructions, addressing modes.
- CO2 Know the factors of instruction set, Case study – instruction sets of some common CPUs.
- CO3 To apply the concept of memory technologies, memory organization.
- CO4 To impart knowledge of Programs and processes—role of interrupts in process state transitions.
- CO5 To know about the speedup, pipeline hazards.
- CO6 To instruct about the Introduction to parallel processors.
- CO7 To explain the mechanism of concept of hierarchical memory organization,. CO8 Gained knowledge about hierarchical memory organization, cache memory.

Mapping of Paper No – PCC-CSE-204

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO3	S	S	S	M	S	S	S	S	S	S	S	S	S	M	S
CO4	S	S	S	S	M	S	S	S	S	S	S	S	S	M	S
CO5	S	S	S	S	S	M	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M
CO7	S	S	S	S	S	S	M	S	S	S	M	S	S	S	S
CO8	M	S	S	S	S	S	M	S	S	S	S	S	S	S	S

S=Strong M=Medium W=Weak

Suggested reference books:

- 1) “Computer System Architecture”, 3rd Edition by M. Morris Mano, Pearson.
- 2) Computer System Architecture and Organization: by Usha, Wiley India Ltd.
- 3) “Computer Organization and Embedded Systems”, 6th Edition by Carl Hamacher, McGrawHill Higher Education.

4) “Computer Architecture and Organization”, 3rd Edition by John P. Hayes, WCB/McGraw-Hill

Course code	LC-CSE-214				
Category	Professional Core Course				
Course title	Object Oriented Programming Lab Using C++				
Scheme and Credits	L	T	P	Credits	Semester-II
	0	0	4	2	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Objectives of the course:

To expose the students to the following:

1. How Object-Oriented Programming Concepts works.
2. Concept of binding - early binding and late binding.

Contents:

1. [Classes and Objects] Write a program that uses a class where the member functions are defined inside a class.
2. [Classes and Objects] Write a program that uses a class where the member functions are defined outside a class.
3. [Classes and Objects] Write a program to demonstrate the use of static data members.
4. [Classes and Objects] Write a program to demonstrate the use of const data members.
5. [Constructors and Destructors] Write a program to demonstrate the use of zero argument and parameterized constructors.
6. [Constructors and Destructors] Write a program to demonstrate the use of dynamic constructor.
7. [Constructors and Destructors] Write a program to demonstrate the use of explicit constructor.
8. [Initializer Lists] Write a program to demonstrate the use of initializer list.
9. [Operator Overloading] Write a program to demonstrate the overloading of increment and decrement operators.
10. [Operator Overloading] Write a program to demonstrate the overloading of binary arithmetic operators.
11. [Operator Overloading] Write a program to demonstrate the overloading of memory management operators.
12. [Inheritance] Write a program to demonstrate the multilevel inheritance.
13. [Inheritance] Write a program to demonstrate the multiple inheritance.
14. [Inheritance] Write a program to demonstrate the virtual derivation of a class.
15. [Polymorphism] Write a program to demonstrate the runtime polymorphism.

16. [Exception Handling] Write a program to demonstrate the exception handling.
17. [Templates and Generic Programming] Write a program to demonstrate the use of function template.
18. [Templates and Generic Programming] Write a program to demonstrate the use of class template.

Course Outcomes:

- CO1 To introduce the concept of interface and implementation of a class.
- CO2 To describe the nested classes, local classes, abstract classes.
- CO3 To apply the concept of ambiguity in multiple and multipath inheritance.
- CO4 To impart knowledge of accessing data through pointers.
- CO5 To know about the copy constructor, dynamic constructors.
- CO6 To instruct about the basic type to class type, class type to basic type.
- CO7 To explain the mechanism of , basics of exception handling.
- CO8 Gained knowledge about Function templates, class templates.

Mapping of Paper No – LC-CSE-214

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO3	S	S	S	S	S	S	S	M	S	S	S	S	S	M	S
CO4	S	S	S	S	M	S	S	S	S	S	S	S	S	M	S
CO5	S	S	S	S	S	M	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	M	S	S	S	S	S	S	S	S	M
CO7	S	S	S	S	S	S	M	S	S	S	M	S	S	S	S
CO8	S	S	S	S	S	S	M	S	S	S	M	S	S	S	S

S=Strong M=Medium W=Weak

Course code	LC-CSE-213				
Category	Professional Core Course				
Course title	Data Structures and Algorithms Lab Using C				
Scheme and Credits	L	T	P	Credits	Semester-II
	0	0	4	2	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Objectives of the course:

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques

Data Structures Lab List of practical exercises, to be implemented using object-oriented approach in C++ Language.

1- Write a menu driven program that implements following operations (using separate functions) on a linear array:

1-1- Insert a new element at end as well as at a given position

1-2- Delete an element from a given whose value is given or whose position is given

1-3- To find the location of a given element

1-4- To display the elements of the linear array

2- Write a menu driven program that maintains a linear linked list whose elements are stored in on ascending order and implements the following operations (using separate functions):

2-1- Insert a new element

2-2- Delete an existing element

2-3- Search an element

2-4- Display all the elements

3- Write a program to demonstrate the use of stack (implemented using linear array) in converting arithmetic expression from infix notation to postfix notation.

4- Program to demonstrate the use of stack (implemented using linear linked lists) in evaluating arithmetic expression in postfix notation.

5- Program to demonstration the implementation of various operations on a linear queue represented using a linear array.

6- Program to demonstration the implementation of various operations on a circular queue represented using a linear array.

7- Program to demonstration the implementation of various operations on a queue represented using a linear linked list (linked queue).

- 8- Program to illustrate the implementation of different operations on a binary search tree.
- 9- Program to illustrate the traversal of graph using breadth-first search
- 10- Program to illustrate the traversal of graph using depth-first search.
- 11- Program to sort an array of integers in ascending order using bubble sort.
- 12- Program to sort an array of integers in ascending order using selection sort.
- 13- Program to sort an array of integers in ascending order using insertion sort.
- 14- Program to sort an array of integers in ascending order using radix sort.
- 15- Program to sort an array of integers in ascending order using merge sort.
- 16- Program to sort an array of integers in ascending order using quick sort.
- 17- Program to sort an array of integers in ascending order using heap sort.
- 18- Program to sort an array of integers in ascending order using shell sort.
- 19- Program to demonstrate the use of linear search to search a given element in an array.
- 20- Program to demonstrate the use of binary search to search a given element in a sorted array in ascending order.

Course Outcomes:

- CO1 To introduce the concept of Choice of right Data Structure, Algorithms.
- CO2 To describe the factors Linear Search and Binary Search Techniques.
- CO3 To apply the concept Algorithms and their complexity analysis.
- CO4 To impart knowledge of Priority Queue; Operations on each types of Queues.
- CO5 To know about the operations their algorithms and the complexity analysis.
- CO6 To instruct about the Applications of Binary Trees.

Course code	HS102				
Category	Basic Science Course				
Course title	Design Thinking				
Scheme and Credits	L	T	P	Credits	Semester-II
	0	0	2	1	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

COURSE OBJECTIVE(S):

The objective of this Course is to provide the new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products which useful for a student in preparing for an engineering career.

COURSE CONTENTS:

Unit 1: An Insight to Learning

Understanding the Learning Process, Kolb's Learning Styles, Assessing and Interpreting

Unit 2: Remembering Memory

Understanding the Memory process, Problems in retention, Memory enhancement techniques

Unit 3: Emotions: Experience & Expression

Understanding Emotions: Experience & Expression, Assessing Empathy, Application with Peers

Unit 4: Basics of Design Thinking

Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) – **Empathize, Define, Ideate, Prototype, Test**

Unit 5: Being Ingenious & Fixing Problem

Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving

Unit 6: Process of Product Design

Process of Engineering Product Design, Design Thinking Approach, Stages of Product Design, Examples of best product designs and functions, **Assignment – Engineering Product Design**

Unit 7: Prototyping & Testing

What is Prototype? Why Prototype? Rapid Prototype Development process, Testing, **Sample Example**, Test Group Marketing

Unit 8: Celebrating the Difference

Understanding Individual differences & Uniqueness, Group Discussion and Activities to encourage the understanding, acceptance and appreciation of Individual differences

Unit 9: Design Thinking & Customer Centricity

Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design

Unit 10: Feedback, Re-Design & Re-Create

Feedback loop, Focus on User Experience, Address “ergonomic challenges, User focused design, rapid prototyping & testing, final product, Final Presentation – **“Solving Practical Engineering Problem through Innovative Product Design & Creative Solution”**”.

Course Outcomes (CO):

Student will able to

1. Compare and classify the various learning styles and memory techniques and Apply them in their engineering education
2. Analyze emotional experience and Inspect emotional expressions to better understand users while designing innovative products
3. Develop new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products
4. Propose real-time innovative engineering product designs and Choose appropriate frameworks, strategies, techniques during prototype development
5. Perceive individual differences and its impact on everyday decisions and further Create a better customer experience

Course code	HSMC (H-102)				
Category	Human Values				
Course title	Universal Human Values: Understanding Harmony and Ethical Human Conduct				
Scheme and Credits	L	T	P	Credits	Semester-II
	2	0	0	-	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	-----				
Exam	50 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Pre-requisites: None. Universal Human Values 1 (Desirable)

Objectives of UHV Course

This introductory course input is intended:

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Thus, this course is intended to provide a much-needed orientational input in value education to the young enquiring minds.

Unit 1

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Understanding the need, basic guidelines, content and process for Value Education Self Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration.

Continuous Happiness and Prosperity- A look at basic Human Aspirations

Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority

Unit 2

Understanding Harmony in the Human Being - Harmony in Myself

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'

Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha

Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Swasthya

Unit 3

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship Understanding harmony in the Family- the basic unit of human interaction

Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure Ubhay-tripti

Trust (Vishwas) and Respect (Samman) as the foundational values of relationship

Understanding the meaning of Vishwas; Difference between intention and competence

Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship

Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals

Unit 4

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the Nature Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values Definitiveness of Ethical Human Conduct

Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

Competence in Professional Ethics:

a) Ability to utilize the professional competence for augmenting universal human order

b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models

Reference Books:

1. R R Gaur, R Sangal, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, Excel Books, 2009. ISBN: 978-9-350-62091-5
2. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
3. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
4. R. Subramanian, Professional Ethics includes Human Values, Oxford Univ. Press.
5. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
6. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
7. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
8. P.L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.

9. A N Tripathy, 2003, Human Values, New Age International Publishers.
10. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
11. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
12. M Govindrajan, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
13. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.