

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, Pune0

DEPARTMENT OF COMPUTER ENGINEERING



Curriculum Structure and Syllabus of S.Y. B. Tech Courses

Approved by BoS Computer Engineering (date 23/06/2021)

With Effect From 2021-22

Under B. Tech. Computer Engineering (Course 2020)

Vision and Mission of Institute

Institute Vision

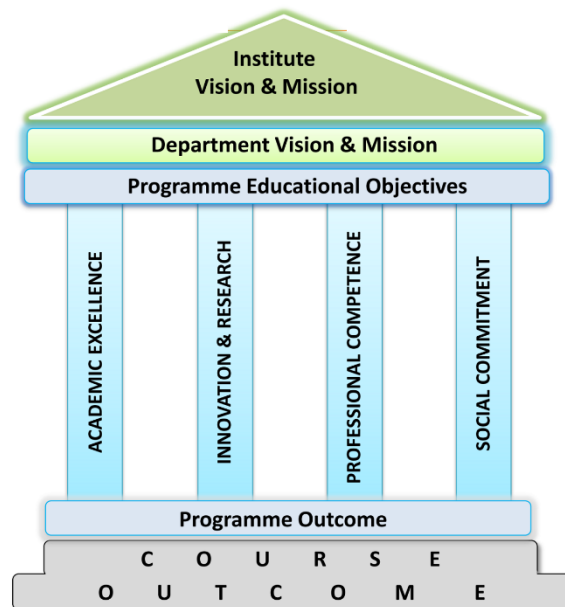
To serve the Society, Industry, and all stake holders through Value-Added Quality Education.

Institute Mission

To serve the need of the society at large by establishing state-of-the-art Engineering, Management and Research institute and impart Attitude, Knowledge and Skills with Quality Education to develop individuals and teams with ability to think and analyze right values and self-reliance.

Quality Policy

We at PCCOE are committed to impart Value Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders. We shall strive for academic excellence, professional competence and social commitment in fine blend with innovation and research. We shall achieve this by establishing and strengthening state-of-the-art Engineering and Management Institute through continual improvement in effective implementation of Quality Management System.



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LIST OF ABBREVIATIONS USED IN STRUCTURE

SR. NO.	ABBREVIATION	TYPE OF COURSE
1.	BSC	Basic Science Course
2.	ECC	Engineering Core/ Science Course
3.	HSMC	Humanities, Social Sciences and Management Course
4.	PCC	Programme / Professional Core Course
5.	PEC	Programme / Professional Elective Course
6.	OEC	Open Elective Course
7.	PROJ	Project
8.	INTR	Internship
9.	Audit	Audit Course
10.	MC	Mandatory Course
11.	LS	Life Skill
12.	PFC	Proficiency Course
13.	MO	MOOC Course
14.	L	Lecture
15.	P	Practical
16.	T	Tutorial
17.	H	Hours
18.	Cr	Credits
19.	CIE	Continuous Internal Evaluation
20.	IE	Internal Evaluation
21.	MTE	Mid Term Evaluation
22.	ETE	End Term Evaluation
23.	TW	Term Work
24.	OR	Oral
25.	PR	Practical

CURRICULUM FRAMEWORK (2020-2021; 2021-2022; 2022-2023; 2023-2024)

The B.Tech. Program is based on the following type of course: B.Tech Computer Engineering

SR. NO.	TYPE OF COURSE	ABBREVIATION
26.	Basic Science Course	BSC
27.	Engineering Core/ Science Course	ECC
28.	Humanities, Social Sciences And Management Course	HSMC
29.	Programme / Professional Core Course	PCC
30.	Programme / Professional Elective Course	PEC
31.	Open Elective Course	OEC
32.	Project	PROJ
33.	Internship	INTR
34.	Audit Course	Audit
35.	Mandatory Course	MC
36.	Life Skill	LS
37.	Proficiency Course	PFC
38.	MOOC Course	MO

The Course and Credit Distribution is as under,

SR. No.	TYPE OF COURSE	NO. OF COURSES	TOTAL CREDITS	
			NO.	%
1.	Basic Science Course (BSC)	8	23	14
2.	Engineering Core/ Science Course (ECC)	15	22	14
3.	Humanities, Social Sciences And Management Course (HSMC)	6	13	8
4.	Professional Core Course (PCC)	18	48	30
5.	Professional Elective Course (PEC)	9	18	11
6.	Open Elective Course (OEC)	6	18	11
7.	Project (PROJ)	2	16	10
8.	Internship (INTR)	1	3	2
9.	Audit Course (Audit)	3	0	0
10.	Mandatory Course (MC)	2	0	0
11.	Life Skill (LS)	4	0	0
12.	Proficiency Course (PFC)	3	0	0
13.	MOOC Course	1	0	0
Total		78	161	100

The Semester wise Course Distribution is as under,

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 (BSC)	3	3	2	-	-	-	-	-	8
2.	Engineering Core Course (ECC)	5	6	2	2	-	-	-	-	15
3.	Humanities, Social Sciences and Management Course (HSMC)	1	1	1	1	1	1	-	-	6
4.	Professional Core Course (PCC)	-	-	4	5	3	3	3	-	18
5.	Professional Elective Course (PEC)	-	-	-	-	3	3	3	-	9
6.	Open Elective Course (OEC)	-	-	-	1	1	2	2	-	6
7.	Project (PROJ)	1	-	-	-	-	-	-	1	2
8.	Internship (INTR)	-	-	-	-	-	-	-	1	1
9.	Audit Course (Audit)	-	-	-	1	1	1	-	-	3
10.	Mandatory Course (MC)	-	-	-	-	1	1	-	-	2
11.	Life Skill (LS)	1	1	1	1	-	-	-	-	4
12.	Proficiency Course (PFC)	-	-	-	1	1	1	-	-	3
13.	MOOC Course	-	-	-	-	-	-	-	1	1
Total		11	11	10	12	11	12	8	3	78

The Semester wise Credit Distribution is as under,

CREDIT DISTRIBUTION : SEMESTER WISE										
1 Lecture hour = 1 Credit 2 Lab Hours = 1 Credit 1 Tutorial Hour = 1 Credit										
SR No	TYPE OF COURSE	NO. OF Credits / SEMESTER								Total
		1	2	3	4	5	6	7	8	
1.	Basic Science Course (BSC)	9	9	5	-	-	-	-	-	23
2.	Engineering Core Course (ECC)	7	9	3	3	-	-	-	-	22
3.	Humanities, Social Sciences and Management Course (HSMC)	2	2	3	2	2	2	-	-	13
4.	Professional Core Course (PCC)	-	-	12	12	8	8	8	-	48
5.	Professional Elective Course (PEC)	-	-	-	-	6	6	6	-	18
6.	Open Elective Course (OEC)	-	-	-	3	3	6	6	-	18
7.	Project (PROJ)	2	-	-	-	-	-	-	14	16
8.	Internship (INTR)	-	-	-	-	-	-	-	3	3
9.	Audit Course (Audit)	-	-	-	-	-	-	-	-	0
10.	Mandatory Course (MC)	-	-	-	-	-	-	-	-	0
11.	Life Skill (LS)	-	-	-	-	-	-	-	-	0
12.	Proficiency Course (PFC)	-	-	-	-	-	-	-	-	0
13.	MOOC Course	-	-	-	-	-	-	-	-	0
Total		20	20	23	20	19	22	20	17	161

CURRICULUM STRUCTURE**Structure for Second Year B.Tech. (Computer Engineering) Semester – III**

Course Code	Course Type	Course Name	Teaching Scheme				Cr	Evaluation Scheme						
			L	P	T	Hrs		CIE		ETE	TW	PR	OR	Total
								IE	MTE					
BAS3205	BSC	Applied Mathematics	3	-	-	3	3	20	30	50	-	-	-	100
BCE3201	BSC	Discrete Mathematics	2	-	-	2	2	20	30	50	-	-	-	100
BCE3301	ECC	Digital Electronics and Computer Organization	2	-	-	2	2	20	30	50	-	-	-	100
BCE3302	ECC	Digital Electronics Laboratory	-	2	-	2	1	-	-	-	25	25	-	50
BCE3401	PCC	Data Structure and Algorithms	4	-	-	4	4	20	30	50	-	-	-	100
BCE3402	PCC	Object Oriented Programming	4	-	-	4	4	20	30	50	-	-	-	100
BCE3403	PCC	Data Structure and Algorithms Laboratory	-	4	-	4	2	-	-	-	25	25	-	50
BCE3404	PCC	Project Based Learning – I	-	4	-	4	2	-	-	-	25	50	25	100
BHM3101	HSMC	Universal Human Values	2	-	-	2	2	20	-	30	-	-	-	50
BHM3939	LS	Life Skills – III	-	2	-	2	0	-	-	-	-	-	-	-
Total			17	12	0	29	22							750

L-Lecture, P-Practical, T-Tutorial, H-Hours, Cr-Credits, CIE- Continuous Internal Evaluation, IE- Internal Evaluation, MTE- Mid Term Evaluation, ETE- End Term Evaluation, TW- Term Work, OR- Oral, PR- Practical

Structure for Second Year B.Tech. (Computer Engineering) Semester – IV

Course Code	Course Type	Course Name	Teaching Scheme				Cr	Evaluation Scheme						
			L	P	T	Hrs		CIE		ETE	TW	PR	OR	Total
								IE	MTE					
BCE4301	ECC	Microprocessor Architecture	2	-	-	2	2	20	30	50	-	-	-	100
BCE4302	ECC	Microprocessor Architecture Laboratory	-	2	-	2	1				25	25	-	50
BCE4405	PCC	Computer Networks	3	-	-	3	3	20	30	50	-	-	-	100
BCE4406	PCC	Database Management System	3	-	-	3	3	20	30	50	-	-	-	100
BCE4407	PCC	Software Engineering	3	0	-	3	3	20	30	50	-	-	-	100
BCE4408	PCC	Computer Networks Laboratory	-	2	-	2	1	-	-	-	25	25	-	50
BCE4409	PCC	Project Based Learning- II	-	4	-	4	2	-	-	-	25	50	25	100
BAS4601-06	OEC	Open Elective Course – I	3	-	-	3	3	20	30	50	-	-	-	100
BHM4101	HSMC	Professional Skills for Engineers	2	-	-	2	2	20	-	30	-	-	-	50
BCE4911 A-B	PFC	Proficiency Course – I	-	2	-	2	-	-	-	-	-	-	-	-
BHM4940	LS	Life Skills – IV	-	2	-	2	-	-	-	-	-	-	-	-
BHM9961-65	AC	Audit Course – I Constitution of India	1	-	-	1	-	-	-	-	-	-	-	-
Total			17	12	0	29	20							750

L-Lecture, P-Practical, T-Tutorial, H-Hours, Cr-Credits, CIE- Continuous Internal Evaluation, IE- Internal Evaluation, MTE- Mid Term Evaluation, ETE- End Term Evaluation, TW- Term Work, OR- Oral, PR- Practical

List of Proficiency Course-I

Semester- IV

Course Code	Course Name
BCE4911A	C#.Net
BCE4911B	Java Programming

List of Open Elective Course-I

Semester- IV

Course Code	Course Name	
BAS4601	Numerical Methods	Choose any one
BAS4602	Mathematical Optimization	
BAS4603	Calculus of Variation	
BAS4604	Mathematical Modeling and Simulation	
BAS4605	Financial Mathematics	
BAS4606	Neural Network and fuzzy logic Control	

List of Life Skills Course III & IV**Semester- III**

Course Code	Course Name: Life Skills-III	
BHM3939	1. Practicing Meditation 2. Sports	Choose any one
	Performing Arts: Music, Singing, Poetry, Indian Conventional Dancing, Photography, Short Movie Making, Painting/ Sketching/ Drawing, Theatre Arts, Anchoring, Calligraphy etc.	Choose any one performing arts

Semester- IV

Course Code	Course Name: Life Skills-IV	
BHM4940	1. Social welfare and Cultural Awareness 2. Transactional Analysis	Choose any one
	Caring and service Hospital Caring, Personal Safety, First Aid, Disaster Management Gardening, Organic farming, Cooking etc.	Choose any one caring & service

**Course Syllabus
Semester III**

Program:	B. Tech. (Computer)			Semester :	III		
Course :	Applied Mathematics			Code :	BAS3205		
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	Total
3	-	-	3	20	30	50	100
Prior knowledge of							
<ol style="list-style-type: none"> 1. Univariate Calculus 2. Multivariate Calculus is essential.							
Course Objectives:							
After completion of the course, students will have adequate background, conceptual clarity and knowledge of mathematical principles related to:							
<ol style="list-style-type: none"> 1. Linear differential equations of higher order applicable to Computer gaming. 2. Transform techniques such as Fourier transform, Z-transform and applications to Image processing. 3. Vector calculus necessary to analyze and design complex electrical and electronic devices as appropriate to Computer engineering. 4. Different statistical methods and theory of probability. 							
Course Outcomes:							
After learning the course, the students should be able to:							
<ol style="list-style-type: none"> 1. Apply the concepts of higher order linear differential equations to analyze computer gaming. 2. Solve problems related to Fourier transform using properties.. 3. Evaluate Z-Transform and apply it to solve difference equations. 4. Perform vector differentiation to analyze the vector fields. 5. Analyze numerical data, using standard procedures of statistical modeling and probability theory to predict the performance. 6. Apply different hypothesis tests based on data given and conclusion about acceptance or rejection of sample data. 							
Detailed Syllabus:							
Unit	Description						Duration (H)
I	Linear Differential Equations (LDE): Introduction of Linear and Nonlinear 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 computer gaming.						6
II	Fourier Transform (FT): Complex exponential form of Fourier series, Fourier integral theorem, Fourier Sine & Cosine integrals, Fourier transform, Fourier Sine and Cosine transforms and their inverses.						6
III	Z - Transform (ZT): Introduction, Standard properties, Z Transform of discrete functions and their inverses. Solution of difference equations.						6
IV	Statistics & Probability: Measures of Variability: Standard Deviation, Variance, Quartiles, Interquartile Range, Probability Distribution: Binomial Distribution, Poisson Distribution, Normal Distribution.						6
V	Sampling & Inference: Sampling: Introduction, Types of Sampling, Statistical Significance (p values), Hypothesis testing, Types of errors, level of significance, Pearson's r test, z-test, t-test, Chi square test, ANOVA test.						6
VI	Vector Differentiation: Introduction, Vector differential operators, Gradient, Divergent, Curl, Physical Interpretation of Vector Differentiation, Directional Derivatives, Solenoidal, Irrotational and conservative fields, Scalar Potential.						6
	Total						36
Text Books:							
<ol style="list-style-type: none"> 1. B.V. Ramana , "Higher Engineering Mathematics", Tata McGraw-Hill, 34 edition, ISBN 13:9780070634190 2. Erwin Kreyszig, "Advanced Engineering Mathematics" Wiley Eastern Ltd.,10 Edition, ISBN 13: 9780470458365 							
Reference Books:							
<ol style="list-style-type: none"> 1. Peter V. O'Neil, "Advanced Engineering Mathematics", Thomson Learning ,7 Edition, ISBN 13: 9781337274524 							

2. M. D. Greenberg , “Advanced Engineering Mathematics”, Pearson Education, 2 Edition, ISBN 13: 9780486492797
3. S.R.K. Iyengar, Rajendra K. Jain, “Advanced Engineering Mathematics”, Alpha Science International, Ltd,4 Edition, ISBN 13: 9781842658468
4. B. S. Grewal , “Higher Engineering Mathematics”, Khanna Publication, 42 Edition, ISBN 13: .9788174091955
5. N. P. Bali, Manish Goyal, “ A textbook of Engineering Mathematics”, 9th Edition, ISBN 16:978-8131808320

e-sources:

1. NPTEL Course lectures links:

<https://nptel.ac.in/courses/111/105/111105090/> (Probability)

https://onlinecourses.nptel.ac.in/noc20_ma13/ (Advanced Engineering Mathematics)

2. V-lab (IIT-Bombay) link: http://vlabs.iitb.ac.in/vlabs-dev/labs/numerical_lab/labs/explist.php

Program:	B. Tech. (Computer)			Semester:	III		
Course:	Discrete Mathematics			Code:	BCE3201		
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
2	-	2	2	20	30	50	100
Prior Knowledge of : 1. Linear Algebra and Univariate Calculus is essential.							
Course Objectives: 1 To use appropriate set, function and relation models to understand practical examples and interpret the associated operations and terminologies in context. 2 To learn logic and proof techniques to expand mathematical maturity. 3 To interpret set theory, graph theory and algebraic structure. 4 To formulate problems precisely, solve the problems, apply formal proof techniques and explain the reasoning clearly.							
Course Outcomes: After learning the course, students will be able to: 1 Solve real world problems logically using appropriate set, function and relation models. 2 Analyze logical Propositions via truth tables. 3 Identify various types of relations and their properties. 4 Demonstrate and use the concept of graphs, trees and related discrete mathematics, apply the methods from these subjects in problem solving. 5 Prove the basic results of group theory and ring theory. 6 Analyze and synthesize the real-world problems using discrete mathematics.							
Detailed Syllabus:							
Unit	Description						Duration (H)
I	Set Theory and Logics: Significance of Discrete Mathematics in Computer Engineering, Application areas in Computer Engineering. Set Theory: Introduction to Set, Set Representation, Set Builder Form, Roster Form, Types of Sets, Set Operations, Principle of Inclusion and Exclusion. Logics and Proofs: Propositions, Conditional Propositions, Truth Tables, Logical Connectivity, Proposition Calculus, Universal and Existential Quantifiers, Translating English Statements into Propositions, Mathematical Induction.						6

II	<p>Relation & Function: 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.</p>	6
III	<p>Graph & Trees: Basic Terminology and Special Types of Graphs, Paths and Circuits, Hamiltonian and Euler Paths and Circuits, Isomorphic Graphs, Planer Graph, Dijkstra's Shortest Path Algorithm, Case Study: Applications of Graph Theory in Computer Engineering. Trees: Trees, Rooted Trees, Prefix Codes, Huffman Algorithm for Optimal Tree, Spanning Trees, Minimum Spanning Trees, Kruskal's and Prim's Algorithm for Minimum Spanning Tree. Case Study: Applications of Trees in Computer Engineering.</p>	6
IV	<p>Group Theory: Basic Properties of Group, Semigroup & Monoid, Abelian group, Subgroup, Normal subgroup, Groups and Coding, Rings, Integral Domain and Field. Case Study: Application of Group Theory in Computer Engineering.</p>	6
	Total	24
<p>Textbooks: 1. C. L. Liu, "Elements of Discrete Mathematics", Tata McGraw-Hill, 4th Edition, 2017, ISBN 978- 1259006395.</p>		
<p>Reference Books: 1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw-Hill, 8th Edition, 2018, ISBN 978-1259676512. 2. Dr. K. D. Joshi, "Foundations of Discrete Mathematics", New Age International Limited Publishers, 2nd Edition, January 2014, ISBN-13: 978-8122435986.</p>		

Program:	B. Tech. (Computer)			Semester:	III		
Course:	Digital Electronics & Computer Organization			Code:	BCE3301		
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
2	-	2	2	20	30	50	100
Prior Knowledge of :							
1. Basic Electrical and Electronics Engineering is essential.							
Course Objectives:							
1 To get acquainted with the fundamental concept's Digital Electronics circuit design.							
2 To develop skills for the design and implementation of combinational logic circuits.							
3 To develop skills for the design and implementation of sequential logic circuits.							
4 To get acquainted with the basic concept of computer organization.							
Course Outcomes:							
After learning the course, the students will be able to:							
1 Realize and simplify Boolean Algebraic assignments for designing digital circuits using K-Maps.							
2 Design and implement Combinational digital circuits as per the specifications.							
3 Design and implement Sequential digital circuits as per the specifications.							
4 Apply the knowledge to select the appropriate IC as per the design specifications.							
5 Develop a simple embedded system for simple real-world applications.							
6 Demonstrate the basic concepts of computer organization.							
Detailed Syllabus:							
Unit	Description						Duration (H)
I	Introduction: Binary, Hexadecimal numbers, octal numbers, and number conversion. Signed Binary number representation: Signed Magnitude, 1's complement, and 2's complement representation. Logic minimization: Representation of truth-table, SOP form, POS form, Simplification of logical functions, Minimization of SOP and POS forms, don't care conditions Reduction techniques: K-Maps up to 4 variables and Quine-McClusky technique						5
II	Design of Combinational Logic: Code converter - BCD, Excess-3, Gray code, Binary Code. Arithmetic Operations: - Binary Addition, Subtraction, Multiplication, Division, BCD Addition Circuits: Half- Adder, Full Adder, Half Subtractor, Full Subtractor, Binary Adder (IC 7483), BCD adder, Multiplexers (MUX): MUX (IC 74153, 74151), MUX tree, Demultiplexers (DEMUX)- Decoder. (IC 74138, IC 74154). DMUX Tree, Implementation of SOP and POS using MUX, DMUX, Comparators, Parity generators, and Checker.						6

III	Design of Sequential Logic: Flip-Flop: SR, J-K, D, T; Preset & Clear, Master-Slave JK Flip Flops, Truth Tables and Excitation tables, Conversion from one type to another type of Flop-Flop. Registers: SISO, SIPO, PISO, PIPO, Shift Registers, Bidirectional Shift Registers, Counters: Asynchronous Counter, Synchronous Counter, BCD Counter, Johnson Counter, Modulus of the counter (IC 7490), Sequence Generator & detector	7
IV	Computer Organization: Introduction: Function and structure of a computer Functional components, Interconnection of components, Processing Unit: Organization of a processor - Registers, ALU and Control unit, Data path in a CPU, Instruction cycle, Input/Output Subsystem: Access of I/O devices, I/O ports, I/O interfaces - Serial port, Parallel port, PCI bus, SCSI bus, USB bus, I/O peripherals - Input devices, Output devices, Secondary storage devices. Memory Subsystem: Memory cells - SRAM and DRAM cells, Internal Organization of a memory chip, Organization of a memory unit.	6
	Total	24
Textbooks:		
<ol style="list-style-type: none"> 1 R.P.Jain, "Modern Digital Electronics", Tata McGraw-Hill, 4th Edition, 2010 ISBN 978-0-07-06691-16, 2 Moris Mano, "Digital Logic and Computer Design", 2017, Pearson, ISBN 978-93-325-4252-5. 3 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 		
Reference Books:		
<ol style="list-style-type: none"> 1 John Yarbrough, "Digital Logic applications and Design", Cengage Learning, 2006, ISBN 13:978-81-315-0058-3. 2 Norman B & Bradley, "Digital Logic and Design Principles", Wiley India Ltd, 2000, ISBN 978-81-265-1258-4. 3 D. Leach, Malvino, Saha, "Digital Principles and Applications", Tata McGraw Hill, 2011, ISBN 13:978-0-07-014170-4. 		

Program:	B. Tech. (Computer)			Semester:	III		
Course:	Digital Electronics Laboratory			Code:	BCE3302		
Teaching Scheme				Evaluation Scheme			
Practical	Tutorial	Credit	Hours	TW	PR	OR	Total
2	-	1	2	25	25	-	50
Course Objectives:							
<ol style="list-style-type: none"> 1 To get acquainted with the fundamental concepts of Digital Electronics circuit design. 2 To develop skills for the design and implementation of combinational logic circuits. 3 To develop skills for the design and implementation of sequential logic circuits. 4 To get acquainted with the concept of design of counters in sequential logic circuits. 							
Course Outcomes:							
After learning the course, students will be able to:							
<ol style="list-style-type: none"> 1 Realize Boolean expressions for designing digital circuits using K-Maps. 2 Design and implement combinational digital circuits as per the specifications. 3 Design and implement sequential digital circuits as per the specifications. 4 Apply the knowledge to select the appropriate IC as per the design specifications. 5 Design and implement synchronous and asynchronous counters. 6 Realize the digital circuit using a digital trainer kit simulator. 							
Guidelines for Students							
<ul style="list-style-type: none"> • The laboratory assignments are to be submitted by students in the form of a journal. • Journal consists of prologue, certificate, table of contents and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, Software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept, circuit diagram, pin configuration, conclusion/analysis). 							
Guidelines for Laboratory /TW Assessment							
<ul style="list-style-type: none"> • Continuous assessment of laboratory work is done based on overall performance and Laboratory performance of 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							
<ul style="list-style-type: none"> • Assignments on all concepts covered in Group A & Group B are mandatory to perform on either on digital trainer kit or online simulator. • Students are expected to work in group of 3 to 4. 							
Assignment No.	Suggested List of Assignments						
Group A- Assignments based on Combinational Logic Design							
1	Design & Implement Half adder & Full Adder using a) Basic Gates and b) Universal Gates.						
2	Design & Implement Half subtractor & Full Subtractor using a) Basic Gates and b) UniversalGates.						

3	Design and Implement Code Converters-Binary to Gray and BCD to Excess-3.
4	Design and Realization of BCD Adder using 4-bit Binary Adder (IC 7483).
5	Design & Realization of Boolean Expression for suitable combinational logic using MUX 74151 / DMUX 74154.
6	Design & Implement Parity Generator using EX-OR.
Group B- Assignments based on Sequential Logic Design.	
7	Design and Realization of Flip Flop Conversion.
8	Design of Ripple Counter using suitable Flip Flops, Realization of 3 bit Up/Down Counter using MS JK Flip Flop / D Flip Flop.
9	Design & Realization of Mod -N counter using (7490 and 74193).
10	Design and Realization of Ring Counter.
11	Design and Implement Sequence generator using JK flip-flop.
12	Design and Implement a pseudo-random Sequence generator.
Reference Books:	
<ol style="list-style-type: none"> 1. John Yarbrough, —Digital Logic applications and Designl, Cengage Learning, ISBN – 13:978-81-315-0058-3, 2006. 2. Norman B & Bradley, —Digital Logic Design Principles, Wiley India Ltd, ISBN:978-81-265-1258-4, 2000. 3. D. Leach, Malvino, Saha, —Digital Principles and Applicationsl, Tata McGraw Hill, ISBN – 13:978-0- 07-014170-4,2011. 	
Web reference:	
1 www.Deldsim.com.	

Program:	B. Tech. (Computer)			Semester:	III		
Course:	Data Structures and Algorithms			Code:	BCE3401		
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
4	-	4	4	20	30	50	100
Prior Knowledge of :							
1. Decision control structures, loop control structures, arrays, Functions, pointers, structure and union, searching and sorting techniques.							
is essential							
Course Objectives:							
1 To understand the standard and abstract data representation methods.							
2 To operate on the various structured data.							
3 To build the logic to use appropriate data structure in logical and computational solutions.							
4 To understand various data searching and sorting methods with pros and cons.							
5 To develop a logic for graphical modelling of real-life problems.							
Course Outcomes:							
After learning the course, students will be able to:							
1 Develop logic building skills to solve real life problem.							
2 Apply linear data structures to solve various computing problems.							
3 Select appropriate data structure and demonstrate a working solution for a given problem.							
4 Apply nonlinear data structures such as trees and graphs to solve various computing problems.							
5 Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.							
6 Analyze and apply various sorting and hashing techniques to solve computing problems.							
Detailed Syllabus:							
Unit	Description						Duration (H)
I	Introduction to Data structures, Array and Hashing: Types of Data Structure - Linear & Nonlinear, Static & Dynamic, Characteristics of algorithms, Analysis of algorithms – Frequency Count, Time & Space complexity, Array: Memory representation, Array as an abstract data type (ADT), Address Calculation. Hashing: Concepts - Hash table, issues in hashing, hash functions- properties of good hash function, division, multiplication, extraction, mid-square, folding and universal, Collision resolution strategies- open addressing and chaining.						8
II	Linked List: Dynamic Memory Management, Basics of Linked List, Comparison of sequential and linked organizations, Types of linked list, Singly linked list, Doubly linked list, Circular linked list. Applications: Polynomial Operations. Case study: Use of generalized linked list.						8
III	Stack & Queue: Fundamentals of stack, Stack representation using array and linked List, Operations on stack.						

	Applications: Recursion, Validity of parentheses, Expression Conversion. Fundamentals of queue, Queue representation using array and Linked List, Types of queue – Linear Queue, Circular Queue, Double Ended Queue, Priority Queue. Applications: Job Scheduling, Josephus problem. Case study: Evaluation of postfix expression using stack.	8
IV	Tree: Basic terminology, representation using array and linked list, Recursive and Non recursive Tree Traversals, Operations on binary tree: Finding Height, Leaf nodes, counting no of Nodes, Construction of binary tree from traversals, Binary Search tree (BST): Insertion, deletion of a node from BST. Threaded Binary tree (TBT): Creation and traversals on TBT. Height Balanced Tree- AVL tree. Case study: Max Heap, Min Heap using binary tree.	8
V	Graph: Basic Concepts, Storage representation, Adjacency matrix, adjacency list, adjacency multi list, inverse adjacency list. Traversals-depth first and breadth first search, Applications Minimum spanning Tree using Prim's and Kruskal's Algorithm. Case study: Shortest path calculation using graph.	8
VI	Sorting Techniques & Multi way Trees: Sorting methods- Quick sort and Merge Sort, Radix Sort, Heap sort, Shell sort. Multi way Trees: B tree, B+ tree, Red Black tree.	8
	Total	48
Textbooks:		
<ol style="list-style-type: none"> 1 Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, "Fundamentals of Data Structures in C++", University Press(India) Pvt. Ltd., 2nd Edition, 2008, ISBN-10: 8173716064/ ISBN-13:978-8173716065. 2 Varsha H. Patil, "Data Structures using C++", Oxford University Press, 1st Edition, 2012,ISBN-10: 0-19-806623-6/ ISBN-13: 978-0-19-806623-1. 		
Reference Books:		
<ol style="list-style-type: none"> 1 G.A.V. PAI, "Data Structures and Algorithms, Concepts, Techniques and Applications", Tata McGraw-Hill, Volume1 1st Edition, 2017. ISBN-10: 0070667268/ ISBN-13: 978-0070667266. 2 Richard F. Gilberg& Behrouz A. Forouzan, "Data Structures, Pseudo code Approach with C", Cengage Learning India Edition, 2nd Edition, 2007, ISBN 10: 8131503143 ISBN 13: 9788131503140. 3 Y. Langsam, M. Augenstein and A. Tannenbaum, "Data Structures using C", Pearson Education Asia, First Edition, 2002, ISBN 978-81-317-0229-1. 4 Sartaj Sahni, Ellis Horowitz, "Fundamentals of Data Structures in C", Orient blackswan, 2nd Edition, 2010, ISBN 81-7515-257-5. 5 Y. Langsam, M. Augensteinand, A. Tannenbaum, "Data Structures using C & C++", Pearson Education India, Second Edition,2015, ISBN 10: 9332549311, ISBN 13: 978-9332549319. 		
Web Reference:		
<ol style="list-style-type: none"> 1. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html 		

Program:	B. Tech. (Computer)			Semester:	III		
Course:	Object Oriented Programming			Code:	BCE3402		
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
4	-	4	4	20	30	50	100
Prior Knowledge of: Computer programming and problem solving is essential.							
Course Objectives: <ol style="list-style-type: none"> 1 To explore the principles of Object-Oriented Programming (OOP). 2 To understand object-oriented concepts such as data abstraction, encapsulation, inheritance, dynamic binding, and polymorphism. 3 To use the object-oriented paradigm in program design. 4 To provide a foundation for advanced programming. 5 To provide programming insight using OOP constructs. 							
Course Outcomes: After learning the course, students will be able to: <ol style="list-style-type: none"> 1 Analyze the strengths of object-oriented programming. 2 Apply the different object oriented concepts to build the real time software scenarios. 3 Design object-oriented solutions for small systems involving multiple objects. 4 Illustrate the process of data file manipulations using C++. 5 Apply the concepts of virtual and pure virtual function to solve the complex problems. 6 Develop applications using advanced object-oriented programming concepts. 							
Detailed Syllabus:							
Unit	Description						Duration (H)
I	Introduction to Object Oriented Programming: Introduction, Role of programming languages, need to study programming languages, Characteristics of good programming languages. Introduction to various programming paradigms: Procedural, object-oriented, logical and functional, Features of OOP. Data Types: variables and constants, Class – Data members, Member Functions, and class as abstract data type, Object Visibility Modes, Constructor & Types of Constructors, Destructor, Binding – static & dynamic, Inline Function, Static Members, Static Function, Friend Function, Friend Class, Array of Objects. Case Study: Demonstrate Student Database application using classes, objects, constructor, destructor, friend function in C++.						8
II	Inheritance using C++: Derived class & base class Public, Protected and Private Inheritance, Types of						8

	inheritance, Ambiguity in multiple inheritance & multipath inheritance, Constructor & Destructor in Inheritance, Order of Constructor and Destructor Call. Case Study: Know about Firefox and Thunderbird as one of the popular softwares developed using C++.	
III	Polymorphism using C++: Introduction: Function overloading & Operator overloading: Overloading unary & binary operators, Data conversion, Pointers to Objects, this pointer, Up-casting, down-casting, Virtual function, Pure virtual function, Abstract class. Case Study: Demonstrate Polymorphism for Online Railway Reservation System using C++.	8
IV	Generic Programming & Exception Handling using C++: Generic Programming - Function Template Class templates Template with multiple parameters Exception Handling - Exception Handling: Fundamentals multiple catching nested try statements uncaught exceptions throw and rethrow Stack unwinding. Case Study : Study about use of exception handling in Symbian Operating system that was developed using C++	8
V	File Handling: Classes for file stream operation, Opening and closing a file - File mode, Error Handling functions in file, File Pointers and Their Manipulation, File Operations on Characters, File Operations on Binary Files – Variables, Class Objects, Sequential File Organization, Direct Access Files, Indexed sequential File organization, Linked Organization. Case Study: Demonstrate an application to maintain employee database using file handling.	8
VI	Standard Template Library: Standard Template Library (STL) , components of STL: Containers, algorithms and iterators, Containers- Sequence container, associative containers, container adapters, Iterators- input, output, forward, bidirectional and random access, Algorithms- basic searching and sorting algorithms, min-max algorithm, set operations Case Study: Demonstrate an application for managing Person Record (Name, birth date, telephone no). Perform operations – add, display, search, delete, and update using STL map.	8
	Total	48
Textbooks:		
<ol style="list-style-type: none"> 1 E. Balagurusamy, “Object -Oriented Programming with C++”, McGraw Hill Education, Eighth Edition, Sept. 2020, ISBN-13 : 978-9389949186. 2 Ivor Horton, Peter Van Weert, “Beginning C++20” , Novice Professional, Sixth Edition, 2020, ISBN-13: 978-1484258835 (ISBN-10: 1484258835) 3 Robert Lafore, “OOP in C++”, Pearson Publishing, 4th Edition, 2001, ISBN:0672323087 (ISBN 13: 9780672323089). 		
Reference Books:		
<ol style="list-style-type: none"> 1 Bjarne Stroustrup, The C++ Programming language, Third edition, 2008, Pearson Education. ISBN 9780201889543. 2 Deitel, C++ How to Program, 4 th Edition, Pearson Education,2002, ISBN:81-297-0276-2. 3 Herbert Schildt, C++ The complete reference, Eighth Edition, McGraw Hill Professional, 2011, ISBN:978-00-72226805. 		

Program:	B. Tech. (Computer)	Semester:	III				
Course:	Data Structures & Algorithms Laboratory	Code:	BCE3403				
Teaching Scheme				Evaluation Scheme			
Practical	Tutorial	Credit	Hours	TW	PR	OR	Total
4	-	2	4	25	25	-	50

Course Objectives:

- 1 To implement linear data structures using C++.
- 2 To implement nonlinear data structures using C++.
- 3 To apply various sorting and searching techniques.
- 4 To build an efficient program using online platforms/judges.

Course Outcomes:

After learning the course, students will be able to:

- 1 Develop logic building skills to solve real life problem.
- 2 Select appropriate data structure and demonstrate a working solution for a given problem.
- 3 Implement linear data structures to solve various computing problems.
- 4 Implement hashing and sorting techniques to solve real life problems.
- 5 Develop an application using nonlinear data structure such as tree and graph.
- 6 Implement data structure concepts to build efficient applications using online judge platform.

Guidelines for Laboratory Conduction:

- Assignments on all concepts covered in Group A are mandatory.
- Assignments on all concepts covered in Group B are mandatory and should be implemented on coding platforms such as HackerRank, CodeChef.
- Encourage students for appropriate use of Hungarian notation, proper indentation and comments.
- Use of open-source software is to be encouraged.
- Operating System recommended: - 64-bit Open-source Linux or its derivative.
- Programming tools recommended: - G++/GCC, Eclipse.

Guidelines for Students

- The laboratory assignments are to be submitted by students in the form of a journal.
- Journal consists of prologue, certificate, table of contents and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, Date of Completion, Assessment grade/marks and assessor's sign, Theory- Concept, algorithm, time complexity, sample input and expected output, conclusion).

Guidelines for Laboratory /TW Assessment

- Continuous assessment of laboratory work is done based on overall performance and Laboratory performance of 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.

Assignment No.	Suggested List of Assignments
Group A	
1	Consider an employee database of N employees. Make use of a hash table implementation to quickly look up the employee's id number.
2	Write a C++ program to implement a singly link list and perform operations such as insert, delete, display, search element from it and reverse the list.
3	Write a C++ program to perform infix to postfix conversion using stack.
4	Write a C++ program to implement the following data structures and its operations using linked list: i) Stack ii) Queue.
5	Write a C++ program to implement a threaded binary tree and its traversal.
6	Write a C++ program to perform the following operations on a height balanced tree: i) Insert a node ii) Search a node iii) Display it in ascending order.
7	Write a C++ program for the implementation of BFS and DFS for a given graph.
8	Write a C++ program to find the minimum spanning tree of a given undirected graph.
9	Write a C++ program to store the monthly salary of an employee in an array. Sort array of numbers in ascending order using Merge sort and Display details of top five employees with the highest salary.
Group B	
10	Write a C++ program to implement a doubly linked list and perform operations such as insert, delete, display and search element from it.
11	Write a C++ program to construct a binary search tree and perform insertion, deletion, searching of a node and its traversal.
12	Write a C++ program to store the monthly salary of an employee in an array. Sort array of numbers in ascending order using Quick sort and Display details of top five employees with the highest salary.
Reference Books:	
<ol style="list-style-type: none"> 1 Richard F. Gilberg & Behrouz A. Forouzan, "Data Structures, Pseudo code Approach with C", Cengage Learning India Edition, 2nd Edition, 2007, ISBN 10: 8131503143 / ISBN 13: 9788131503140. 2 Y. Langsam, M. Augenstein and A. Tannenbaum, "Data Structures using C", Pearson Education Asia, First Edition, 2002, ISBN 978-81-317-0229-1. 3 G.A.V. PAI, "Data Structures and Algorithms, Concepts, Techniques and Applications", Tata McGraw-Hill, Volume 1 1st Edition, 2017. ISBN-10: 0070667268/ ISBN-13: 978-0070667266. 4 Y. Langsam, M. Augenstein and A. Tannenbaum, "Data Structures using C & C++", Pearson Education India, Second Edition, 2015, ISBN 10: 9332549311, ISBN 13: 978-9332549319. 	

Program:	B. Tech. (Computer)			Semester:	III		
Course:	Project Based Learning – I			Code:	BCE3404		
Teaching Scheme				Evaluation Scheme			
Practical	Tutorial	Credit	Hours	TW	PR	OR	Total
4	-	2	4	25	50	25	100

Course Objectives:

- 1 To develop critical thinking and problem-solving ability by exploring and proposing solutions to real life application.
- 2 To provide every student the opportunity to work in a team to inculcate professionalism.
- 3 To choose and implement appropriate data structure for real life application.
- 4 To apply appropriate Object-Oriented features for various applications.

Course Outcomes:

After learning the course, students will be able to:

- 1 Identify the technical aspects of the chosen project with a comprehensive and systematic approach.
- 2 Select appropriate data structure for implementation of chosen application.
- 3 Apply various object-oriented features for problem solving.
- 4 Design solution to the real-life problem.
- 5 Work as an individual or in a team in development of technical projects.
- 6 Develop lifelong learning attitude towards problem solving.

Guidelines for Instructor for Laboratory Conduction:

- Instructor must regularly monitor and mentor students for successful completion of the project throughout semester as per instructions given in list of assignments.
- Instructor is expected to form assignments from the set of suggested assignment list provided in groups- A, B, C, D.
- Instructor is expected to form 9 assignments from group A (covering all concepts Inheritance, Polymorphism, exception handling, generic programming, file handling, STL), 2 assignments from group B, 2 assignments from group C and 1 mini project from group D.
- Instructor is expected to encourage students for appropriate use of Hungarian notation, proper indentation and comments.
- Instructor is expected to encourage use of open-source software.

Guidelines for Students:

- Students are expected to choose real time application in group of 3-4 students and formulate a problem statement
- Students are expected to work on project throughout the semester.
- Throughout the PBL process, students must define and analyze the problem, generate learning issues and apply what they have learned to solve the problem.
- Each student must perform at least 13 assignments and 01 mini-project. All 9 assignments from group A (covering all concepts Inheritance, Polymorphism, exception handling, generic programming, file handling, STL), 2 assignments from group B, 2 assignments from group C, 1 mini project from group D.
- Assignments from Group C should be implemented on coding platforms such as HackerRank, CodeChef etc.
- At the end of each assignment content of OOP and Data structure is to be applied in the Project.
- Assignments should be implemented in C++ language.
- Operating System recommended: - 64-bit Open source Linux or its derivative.
- Programming tools recommended: - G++/GCC, Eclipse.

Assignment No.	Suggested List of Assignments
GROUP - A (Object Oriented Programming using C++)	
1	<p>Define a class to represent a bank account which includes the following members as: Data members: a. Name of the depositor b. Account Number c. Withdrawal amount d. Balance amount in the account Member Functions: e. To assign initial values f. To deposit an amount g. To withdraw an amount after checking the balance h. To display name and balance. Implement the program by using features of OOP in C++.</p> <p>Note: I. Instructor will suggest students to identify and implement classes for their application to be developed as a part of PBL-I project.</p>
2	<p>Write a program using C++ to create a student database system containing the following information: Name, roll number, Class, division, Date of Birth, Blood group, Contact address, telephone number. Use Class, object, inline function. Use static variables and static functions to maintain count of the number of students. Use constructor and destructor.</p> <p>Note: I. Instructor will suggest students to identify the use of inline function, static variables and static functions for their application to be developed as a part of PBL-I project. II. Instructor will suggest students to implement identified OOP features for their application to be developed as a part of PBL-I project. III. Instructor will suggest students to implement Constructor and Destructor in all classes of their selected applications.</p>
3	<p>Consider we want to store the information of different vehicles. Create a class named Vehicle with two data member named mileage and price. Create its two subclasses: *Car with data members to store ownership cost, warranty (by years), seating capacity and fuel type (diesel or petrol). *Bike with data members to store the number of cylinders, number of gears, cooling type(air, liquid or oil), wheel type(alloys or spokes) and fuel tank size(in inches). Make another two subclasses Audi and Ford of Car, each having a data member to store the model type. Next, make two subclasses Bajaj and TVS, each having a data member to store the make-type. Now, store and print the information of an Audi and a Ford car (i.e. model type, ownership cost, warranty, seating capacity, fuel type, mileage and price.).</p> <p>Note: I. Instructor will suggest students to implement reusability feature of OOP using inheritance in their application to be developed as a part of PBL-I project.</p>
4	<p>Implement a class Complex which represents the Complex Number data type. Implement the following operations: a Constructor (including a default constructor which creates the complex number 0+0i). b Overloaded operator + to add two complex numbers. c. Overloaded operator * to multiply two complex numbers. d. Overloaded << and >> to print and read Complex Numbers.</p>

	<p>Write a C++ program to read and display all project information using Operator Overloading.</p> <p>Note: I Instructor will suggest students to identify the use of function overloading and operatoroverloading for their application to be developed as a part of PBL-I project. Instructor will suggest students to implement identified function overloading and operatoroverloading for their application to be developed as a part of PBL-I project.</p>
5	<p>Create a base class called 'SHAPE' having-two data members of type double -member functionget-data()to initialize base class data members - pure virtual member function display-area()to compute and display the area of the geometrical object. Derive two specific classes 'TRIANGLE' and 'RECTANGLE' from the base class Using thesethree classes, design a program that will accept the dimension of a triangle / rectangle interactively and display the area. Implement using C++.</p> <p>Note: I Instructor will suggest students to identify the use of function overloading and operatoroverloading for their application to be developed as a part of PBL-I project. Instructor will suggest students to implement identified function overloading and operatoroverloading for their application to be developed as a part of PBL-I project.</p>
6	<p>Implement matrix class as ADT. Write a program to perform matrix addition, subtraction, andmultiplication. In read matrix function, raise an exception if any attempt is made to have rowsand columns beyond the array size. Raise an exception if any attempt is made to perform matrix operations on matrices which does not satisfy the matrix order criteria. Implement using C++.</p> <p>Note: I Instructor will suggest students to identify the use of exception handling for theirapplication to be developed as a part of PBL-I project. Instructor will suggest students to implement identified exception handling for theirapplication to be developed as a part of PBL-I project.</p>
7	<p>Write a class template to represent a generic vector. Include member functions to perform thefollowing 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.....)</p> <p>Note: I Instructor will suggest students to identify the use of generic programming for theirapplication to be developed as a part of PBL-I project. Instructor will suggest students to implement identified generic programming handling fortheir application to be developed as a part of PBL-I project.</p>
8	<p>Write a program to maintain an employee database in binary file with employee information such as empId, name, age, department, post and salary. Write function for adding new record,displaying all records, searching for a particular employee, updating employee salary and post.Note: I Instructor will suggest students to identify the use of file handling for their application to be developed as a part of PBL-I project. Instructor will suggest students to implement identified file handling for their application to be developed as a part of PBL-I project.</p>
9	<p>a Write C++ program using STL to add binary numbers (assume one bit as one number); useSTL stack. b Write C++ program using STL map for managing Person Record (Name, birth date,telephone no). Perform operations – add, display, search, delete, and update.</p> <p>Note:</p>

	l. Instructor will suggest students to identify and use STL for their application to be developed as a part of PBL-I project.
GROUP - B (Data structures using C++)	
17	<p>Set A of customers like pizza and set B of customers like a burger. Write a C++ program to store two sets using an array. compute and display-</p> <p>a Set of customers who like either pizza or burger or both b Set of customers who like both pizza and burger. c Set of customers who like only pizza, not burger. d Set of customers who like only burger not pizza. e Number of customers who like neither pizza nor burger.</p> <p>Note: e.I Instructor will suggest students to identify suitable data structure for their application to be developed as a part of PBL-I project. Instructor will suggest students to implement identified data structure for their application to be developed as a part of PBL-I project.</p>
18	<p>The ticket booking system of Cinemax theatre has to be implemented using C++ program. There are 15 rows and 10 seats in each row. Doubly linked lists have to be maintained to keep track of free seats in rows. Assume some random booking to start with. Use an array to store pointers (Head pointer) to each row. On demand</p> <p>a The list of available seats is to be displayed b The seats are to be booked c The booking can be cancelled</p> <p>Note: c.I Instructor will suggest students to identify suitable data structure for their application to be developed as a part of PBL-I project. Instructor will suggest students to implement identified data structure for their application to be developed as a part of PBL-I project.</p>
19	<p>A Dictionary stores keywords & its meaning. Provide facility for adding new keywords, deleting keywords, updating values of any entry. Provide a facility to display whole data sorted in ascending/ Descending order. Also find how many maximum comparisons may require for finding any keyword. Use Binary Search Tree for implementation.</p> <p>Note: I Instructor will suggest students to identify suitable data structure for their application to be developed as a part of PBL-I project. Instructor will suggest students to implement identified data structure for their application to be developed as a part of PBL-I project.</p>
GROUP – C (C++ on Online Judge Platform)	
20	Write a C++ program to print all the repeated numbers with their frequency in an array in minimum time complexity
21	Write a C++ program to sort N names in alphabetical order.
22	Write a C++ Program to Check Character is Uppercase, Lowercase, Digit or Special Character.

GROUP - D (Mini project)

23

Develop a Mini project using Object Oriented Programming and appropriate Data structure Concepts:
(The sample list of statements is provided as below, but not limited to)

- a Student Management System
- b Library Management System
- c Airline Reservation System
- d Hospital Management System
- e Hotel Management System
- f Billing System
- g Bus / Railway Reservation System
- h Build a Snakes & Ladders game
- i Sudoku Solver
- j Maze generator
- Dictionary implementation

Reference Books:

- 1 Richard F. Gilberg & Behrouz A. Forouzan, "Data Structures, Pseudo code Approach with C", Cengage Learning India Edition, 2nd Edition, 2007, ISBN 10: 8131503143 / ISBN 13: 9788131503140.
- 2 Herbert Schildt, "C++: The Complete Reference", McGraw Hill Education, 4th Edition, July 2017, ISBN-10 : 007053246X (ISBN-13 : 978-0070532465).
- 3 Y. Langsam, M. Augenstin and A. Tannenbaum, "Data Structures using C", Pearson Education Asia, First Edition, 2002, ISBN 978-81-317-0229-1.
- 4 Bjarne Stroustrup, "The C++ Programming language", Pearson Education, Third edition, 2008, ISBN 9780201889543.

Program:	B. Tech. (Computer)			Semester :	III				
Course :	Universal Human Values (HSMC)			Code:	BHM3101				
Teaching Scheme				Evaluation Scheme					
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	TW	PR	Total
3	-	-	3	30	-	20	-	-	50
Prior knowledge: Nil									
Objectives:									
<p>1. 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.</p> <p>2. 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.</p> <p>3. 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.</p>									
Outcomes:									
After learning the course, the students will be able to:									
<ol style="list-style-type: none"> 1. Develop more awareness of their surroundings, society, social problems and their sustainable solutions, while keeping human relationships and human nature in mind. 2. Develop better critical ability by developing the right understanding of reality 3. Understand and become sensitive to their commitment towards what they believe in (humane values, humane relationships and humane society). 4. Apply what they have learnt to their own self in differ 									
Detailed Syllabus:									
Unit	Description								Duration (H)
1	Introduction to Value Education: Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity – Current Scenario, Method to fulfil the Basic Human Aspirations								06
	Practice Session: Sharing about Oneself, Exploring Human Consciousness, Exploring Natural Acceptance								02
2	Harmony in the Human Being: Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health								06
	Practice Session: Exploring the difference of Needs of Self and Body, Exploring Sources of Imagination in the Self, Exploring Harmony of Self with the Body								02
3	Harmony in the Family: Harmony in the Family – the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, Nine universal values in relationships viz. Trust, Respect, Affection, Care, Guidance, Reverence, Glory, Gratitude, Love								04
	Practice Session: Exploring the Feeling of Trust, Exploring the Feeling of Respect								02
4	Harmony in Society: Understanding Harmony in the Society, Vision for the Universal Human Order, Human Order Five Dimensions								03
	Practice Session: Exploring Systems to fulfil Human Goal								01

5	Harmony in the Nature/Existence: Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence	03
	Practice Session: Exploring the Four Orders of Nature, Exploring Co-existence in Existence	01
6	Implications of the Holistic Understanding – a Look at Professional Ethics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models- Typical Case Studies, Strategies for Transition towards Value-based Life and Profession	04
	Practice Session: Exploring Ethical Human Conduct, Exploring Humanistic Models in Education, Exploring Steps of Transition towards Universal Human Order	02
Total		36

Text Books

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

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
4. On Education - J Krishnamurthy
5. Rediscovering India - by Dharampal
6. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

Links for additional learning

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

Program:	B. Tech. (Computer)			Semester	III					
Course :	Life Skills-III			Code :	BHM3939					
Teaching Scheme				Evaluation Scheme						
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	TW	PR	OR	Total
-	2	-	-	-	-	-	-	-	-	-
Prior knowledge: Nil										
Objectives:										
<ol style="list-style-type: none"> To attain mental, emotional balance and spiritually to achieve self-realization and enlightenment to help better understanding of the inner personality & its establishment of harmony with the external demands. To learn to build team spirit and adapt to the various skills required in various sports activities. To provide a platform to express their mind, body, and emotions through performing arts. 										
Outcomes:										
After completing the course, the students should be able to:										
<ol style="list-style-type: none"> Achieve a balanced state of mind and enjoy improved mental, physical, emotional, and spiritual wellbeing. Apply sportsmanship skills in the context of leadership, sports management etc. Demonstrate the ability to think critically about a variety of visual and performing arts. 										
Detailed Syllabus:										
Unit	Description									Duration (H)
1.	Practicing Meditation Pranayama and Breathing exercises, Meditation Technique, Thoughtless Awareness : Through Patanjali /Sahajayoga/Vipassana /Madhyastha Darshan/ Art of Living etc., or Sports: Indoor Games / Outdoor Games									12
2.	Performing arts Music, Singing, Poetry, Indian Conventional Dancing, Photography, Short Movie Making, Painting/ Sketching/ Drawing, Theatre Arts, Anchoring, Calligraphy etc.									12
	Total									24
Reference Books:										
<ol style="list-style-type: none"> Vishnu Devananda, "Meditation and Mantras", 1978. Swami Vivekananda, "Patanjali's Yoga Sutras", 1 Jan 2012. Shri Mataji Nirmala Devi, "Sahajayoga an Introduction" William Hart , S. N. Goenka, "The Art of Living", 4 August 2009. Dennis Hill, "Meditation Deep Peace", Trafford Publishing, 7 August 2014. Boria Majumdar, Sachin Tendulkar, "Sachin Tendulkar – Playing It My Way", Hodder & Stoughton, Hachette Livre publishing, 6 November 2014. Milkha Singh, "The Race of My Life", 2013. Sfurti Sahare, "Think and Win like Dhoni", 3 July 2016. Dina Serto and Mary Kom, "Unbreakable", 19 November 2013. Ronojoy Sen, "Nation at Play: A History of Sport in India", 2015. Andre Agassi, "Open", 2009. Dr. Monica Hiten Shah, "Sangeet Aradhana", Aradhana Sangeet Academy Ahmedabad, Edition 2018. Kishori Amonkar , "Recreating A Dream", Standard Edition . Veejay Sai & foreward by Girish Karnad, "Drama Queens – Women who created history on Stage", Roli Books publication. Jiwan Pani, "Back to the roots – Essays on Performing Arts of India", 1 January 2004. 										

**Course Syllabus
Semester IV**

Program:	B. Tech. (Computer)			Semester:	IV		
Course:	Microprocessor Architecture			Code:	BCE4301		
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
2	-	2	2	20	30	50	100

Prior Knowledge of:

Digital Electronic and Computer Organization.

is essential.

Course Objectives:

- 1 To learn and distinguish the architecture and programmer's model of 80386 processor.
- 2 To provide practical exposure to the students on Microprocessor design and coding knowledge.
- 3 To understand basic architectural features of processor.
- 4 To identify the system level features and processes of different processors.
- 5 To acquaint the learner with application instruction set and logic to build Assembly Language Programs (ALP).

Course Outcomes:

On completion of the course, students will be able to–

- 1 Understand the Architecture, Instruction set and addressing modes of microprocessor.
- 2 Exemplify advanced features of the 80386DX Microprocessor.
- 3 Use architectural components of the 80386DX Microprocessor for programming.
- 4 Exhibit skill of assembly language programming for the application.
- 5 Compare different processor operating modes such as real, protected and virtual.
- 6 Identify and analyze the tools and techniques used to design, implement, and debug microprocessor-based systems.

Detailed Syllabus:

Unit	Description	Duration (H)
I	Introduction: Representation of Instructions: Machine instructions, Operands, addressing modes, Instruction formats, Instruction sets, Instruction set architectures - CISC and RISC architectures. Cache memory unit - Concept of cache memory, Mapping methods, Replacement Algorithms, Fetch and write mechanisms, Organization of a cache memory unit.	7
II	Processor Organization: Evolution of Intel processor architecture- 4 bit to 64 bit, performance assessment. Register organization, Case Study- register organization of microprocessor 8086/80386 Addressing modes and Formats- Addressing modes- immediate, direct, indirect, register, register indirect, displacement and stack, Case Study-80386 addressing modes Instruction Set/Types of operations - Data transfer, arithmetic, logical, conversion, input-output, system control, and transfer of control, Case Study-Intel 80386 operation types.	6
III	Introduction to 80386DX: Brief History of Intel Processors, 80386DX Features and Architecture, Programmers Model, Operating modes Systems Architecture- Systems Registers (Systems flags, Memory Management registers, Control registers, Debug registers, Test registers), System Instructions	5
IV	Memory Management of 80386DX: Global Descriptor Table, Local Descriptor Table, Interrupt Descriptor Table, GDTR, LDTR, IDTR. Formats of Descriptors and Selector, Segment Translation, Page Translation, Combining Segment and Page translation. Memory management unit - Concept of virtual memory, Address translation, Hardware support for memory management.	6

	Total	24
<p>Textbooks:</p> <ol style="list-style-type: none"> 1 Douglas Hall, "Microprocessors & Interfacing", McGraw Hill, Revised 2nd Edition, 2014 ISBN 0-07-100462-9. 2 A. Ray, K. Bhurchandi, "Advanced Microprocessors and peripherals: Arch, Programming & Interfacing", Tata McGraw Hill, 2004, ISBN 0-07-463841-6. 3 James Turley, "Advanced 80386 Programming Techniques", McGraw-Hill, 3rd edition , 2005 ISBN 10:0078813425, 13:978-0078813429. 4 Introduction to 64 bit Intel Assembly Language Programming for Linux, 2nd Edition, 2012, Ray Seyfarth, ISBN10:1478119209, ISBN-13: 9781478119203 		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1 Ray Seyfarth, "Introduction to 64-bit Intel Assembly Language Programming for Linux", 2nd Edition, 2012, ISBN 10: 1478119209, ISBN-13: 9781478119203. 2 Jeff Duntemann, "Assembly Language Step-by-step: Programming with Linux", Wiley, 3rd Edition, 2009, ISBN 10 0470497025, ISBN-13: 978-0470497029. 3 Chris H. Pappas, William H. Murray, "80386 Microprocessor Handbooks", McGraw-Hill Osborne Media, 2nd edition 2009 ISBN-10: 0078812429, 13: 978-0078812422. 4 Mohammad Rafiqzaman, "Microprocessors: Theory and Applications: Intel and Motorola", 2nd edition 2007 Prentice Hall, ISBN 10:0966498011, 13:978:0966498011 		
<p>Web references:</p> <ol style="list-style-type: none"> 4.1 http://intel80386.com/386htm/toc.html 4.2 Intel 80386 Programmer's Reference Manual :https://css.csail.mit.edu/6.858/2014/readings/i386.pdf 		

Program:	B. Tech. (Computer)			Semester:	IV		
Course:	Microprocessor Architecture Laboratory			Code:	BCE4302		
Teaching Scheme				Evaluation Scheme			
Practical	Tutorial	Credit	Hours	TW	PR	OR	Total
2	-	1	2	25	25	-	50

Course Objectives:

- 1 To learn and distinguish the architecture and programmer's model of 80386 processor.
- 2 To provide practical exposure to the students on Microprocessor design and coding knowledge.
- 3 To understand basic architectural features of processor.
- 4 To identify the system level features and processes of different processors.

To acquaint the learner with application instruction set and logic to build Assembly Language Programs (ALP).

Course Outcomes:

On completion of the course, students will be able to–

- 1 Understand the Architecture, Instruction set and addressing modes of microprocessor.
- 2 Exemplify advanced features of the 80386DX Microprocessor.
- 3 Use architectural components of the 80386DX Microprocessor for programming.
- 4 Exhibit skill of assembly language programming for the application.
- 5 Compare different processor operating modes such as real, protected and virtual.
- 6 Identify and analyze the tools and techniques used to design, implement, and debug microprocessor-based systems.

Guidelines:

- Continuous assessment of laboratory work is based on overall performance and Laboratory assignments performance of student.
- Each Laboratory assignment assessment will 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, efficient codes, punctuality and neatness.
- Operating System: 64-bit Open source Linux or its derivative.
- Programming Tools: Preferably using Linux equivalent or MASM/TASM/NASM/FASM.

Detailed Syllabus:

Assignment No.	Suggested List of Assignments
1	Write X86/64 ALP to accept five 64-bit Hexadecimal numbers from the user and store them in an array and display the accepted numbers.
2	Write X86/64 ALP to accept a string and to display its length.
3	Write an X86/64 ALP to count the number of positive and negative numbers from the array.
4	Write X86/64 ALP to convert 4-digit Hex number into its equivalent BCD number and 5- digit BCD number into its equivalent HEX number. Make your program user friendly to accept the choice from user for: (a) HEX to BCD (b) BCD to HEX (c) EXIT. Display proper strings to prompt the user while accepting the input and displaying the result. (Wherever necessary, use 64-bit registers).
5	Write X86/64 ALP to detect protected mode and display the values of GDTR, LDTR, IDTR, TR and MSW Registers

6	Write X86/64 ALP to perform non-overlapped block transfer without string specific instructions. Blocks containing data can be defined in the data segment.
7	Write X86/64 ALP to perform overlapped block transfer with string specific instructions. Block containing data can be defined in the data segment
8	Write X86/64 ALP to perform multiplication of two 8-bit hexadecimal numbers. Use successive addition and add and shift methods. (Use of 64-bit registers is expected).
9	Write X86 ALP to find, a) Number of Blank spaces b) Number of lines c) Occurrence of a particular character. Accept the data from the text file. The text file has to be accessed during Program_1 execution and write FAR PROCEDURES in Program_2 for the rest of the processing. Use of PUBLIC and EXTERN directives is mandatory.
10	Write X86 ALP to find the factorial of a given integer number on a command line by using recursion. Explicit stack manipulation is expected in the code.
11	Study assignment - Assembling and disassembling of computer systems and Identify Internal Components such as motherboard, RAM, Expansion Card, Power Supply, Internal Memory, Serial Port, Parallel Ports, Peripherals etc.
<p>Reference Books:</p> <ol style="list-style-type: none"> 1 Ray Seyfarth, "Introduction to 64-bit Intel Assembly Language Programming for Linux", 2nd Edition, 2012, ISBN 10: 1478119209, ISBN-13: 9781478119203. 2 Jeff Duntemann, "Assembly Language Step-by-step: Programming with Linux", Wiley, 3rd Edition, 2009, ISBN 10 0470497025, ISBN-13: 978-0470497029. 3 Brey, Barry B, "8086/8088, 80286, 80386 and 80486 Assembly Language Programming", 3rd edition 2005 Prentice Hall, ISBN: 13: 9780023142475. 4 Chris H. Pappas, William H. Murray, "80386 Microprocessor Handbooks", McGraw-Hill Osborne Media, 2nd edition 2004 ISBN-10: 0078812429, 13: 978-0078812422. 5 Mohammad Rafiquzzaman, "Microprocessors: Theory and Applications: Intel and Motorola", 2nd edition 2007 PrenticeHall, ISBN 10:0966498011, 13:978:0966498011. <p>Intel 80386 Programmer's Reference Manual:</p> <ol style="list-style-type: none"> 1 http://intel80386.com/386htm/toc.html 2 https://css.csail.mit.edu/6.858/2014/readings/i386.pdf 	

Program:	B. Tech. (Computer)			Semester:	IV		
Course:	Computer Networks			Code:	BCE4405		
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
3	-	3	3	20	30	50	100
<p>Prior Knowledge of: Digital Electronics. is essential.</p>							
<p>Course Objectives:</p> <ol style="list-style-type: none"> To understand the fundamental concepts of networking standards, protocols and technologies. To learn different techniques for framing, error control, flow control and routing. To learn the role of protocols at various layers in the protocol stacks. To learn network programming. To develop an understanding of modern network architectures from a design and performance perspective. 							
<p>Course Outcomes: After learning the course, students will be able to:</p> <ol style="list-style-type: none"> Explain digital modulation and multiplexing techniques. Compare various networking protocols and algorithms. Define various wireless networking concepts. Discuss and use different techniques for error control, flow control and routing. Differentiate various IEEE standards at the data link layer. Distinguish various addressing mechanisms of different layers of TCP/IP model. 							
Detailed Syllabus:							
Unit	Description						Duration (H)
I	<p>Basics of Communication: Communication System, Baseband, Broadband and Carrier Communication, transmission modes, Baud rate, bit rate, SNR, Channel Bandwidth and rate of communication. Digital Modulation Techniques: PCM, PCM Encoder and Decoder, DPCM, Delta modulation, Line Coding techniques: Bipolar, Unipolar, Manchester, Block coding techniques. Multiplexing techniques: TDM, FDM, WDM, OFDM and CDMA, TD-SCDMA, LTE TDD, LTE-FDD. Introduction of LAN; MAN; WAN; PAN, Ad-hoc Network</p>						6
II	<p>Physical Layer: OSI Model, TCP/IP Model, Topologies: Star and Hierarchical; Transmission Mediums: CAT5, 5e, 6, OFC and Radio Spectrum, Network Devices: Bridge, Switch, Router, Brouter and Access Point, Spread Spectrum: Frequency Hopping (FHSS) and Direct Sequence (DSSS).</p>						6
III	<p>Data Link Layer LLC: Design Issues: Services to Network Layer, Framing, Error Control and Flow Control. Error Control: Parity Bits and CRC. Flow Control Protocols: Unrestricted Simplex, Stop and Wait, Sliding Window Protocol, WAN Connectivity: HDLC MAC: Channel allocation: Static and Dynamic, Multiple Access Protocols: CSMA, WDMA, IEEE 802.3 Standards and Frame</p>						6

	Formats: CSMA/CD, Binary Exponential Back-off algorithm, Fast Ethernet, Gigabit Ethernet, IEEE 802.11a/b/g/n Frame formats, CSMA/CA.	
IV	Network Layer: Switching techniques, IP Protocol, IPv4 and IPv6 addressing schemes, Subnetting, NAT, CIDR, ICMP, Routing Protocols: Distance Vector, Link State, Routing in Internet: RIP, OSPF, BGP, Congestion control, MPLS, Mobile IP	6
V	Transport Layer: Services, Berkeley Sockets, Addressing, Connection establishment, Connection release, Flow control and buffering, Multiplexing, TCP, TCP Timer management, TCP Congestion Control, Real Time Transport protocol (RTP), Stream Control Transmission Protocol (SCTP), Quality of Service (QoS), Differentiated and Integrated services, TCP and UDP for Wireless, Introduction to Network Security, Transport Layer Security (TLS) handshake.	6
VI	Application Layer: Network Architectures: Client-Server; Peer To Peer, Domain Name System (DNS), Hyper Text Transfer Protocol (HTTP), Hypertext Transfer Protocol Secure (HTTPS) and need for HTTPS, SSL, Email: SMTP, MIME, POP3, Webmail, FTP, TELNET, Dynamic Host Control Protocol (DHCP), Simple Network Management Protocol (SNMP).	6
	Total	36
Textbooks:		
<ol style="list-style-type: none"> 1 Andrew S. Tanenbaum, "Computer Networks", Pearson Education India, 6th Edition, 2021 ISBN: 9780136764052, 0136764053. 2 Fourauzan B., "Data Communications and Networking", 5th Edition, Tata McGraw- Hill Publications, 2013 ISBN: 1259064751 · 9781259064753. 		
Reference Books:		
<ol style="list-style-type: none"> 1 Kurose, Ross, "Computer Networking a Top-Down Approach Featuring the Internet", 8/E, 2021, ISBN-10: 0136681557, ISBN-13: 9780136681557, 2021, Pearson. 2 Matthew S. G, "802.11 Wireless Networks", O., Reilly publications, 3rd Edition, 2017, ISBN: 81-7656-992-5. 		

Program:	B. Tech. (Computer)			Semester:	IV		
Course:	Database Management System			Code:	BCE4406		
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
3	-	3	3	20	30	50	100

Prior Knowledge of:

- a Discrete Mathematics
- b Data Structure and algorithms

is essential.

Course Objectives:

- 1 To understand the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database system implementation.
- 2 To provide a strong formal foundation in database concepts, technology, and practice.
- 3 To give systematic database design approaches covering conceptual design, logical design and an overview of physical design.
- 4 To make students familiar with the basic issues of transaction processing and concurrency control.
- 5 To learn a powerful, flexible, and scalable general-purpose database to handle big data.
- 6 To learn and understand Advances in Databases and Applications.

Course Outcomes:

After learning the course, students will be able to:

- 1 Design E-R Model for given requirements and convert the same into database tables.
- 2 Design schema in appropriate normal form considering actual requirements.
- 3 Write queries and PL/SQL Code blocks for given requirements, using different SQL and PL/SQL concepts.
- 4 Convert the given schedule in serializable (Conflict/view) schedule to achieve benefits of serializability.
- 5 Apply different concurrency control and recovery methods in real time situations.
- 6 Use advanced database Programming concepts like mongoDB.

Note: Case studies mentioned in Unit IV & Unit V are just to get understanding to students, will not be considered for evaluation

Detailed Syllabus:

Unit	Description	Duration (H)
I	Introduction to Database System and ER Modeling Introduction to Database Management Systems, Purpose of Database Systems, Database-System Applications, View of Data, Database Languages, Database System Structure, Data Models, Database Design and ER Model: Entity, Attributes, Relationships, Constraints, Keys, Design Process, Entity Relationship Model, ER Diagram, Design Issues, Extended E-R Features, converting E-R & EER diagram into tables. Case Study: Design ER Model for any real time application and convert the same into tables on paper.	6
II	SQL and PL/SQL SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, DCL, TCL, SQL Operators, Tables: Creating, Modifying, Deleting, Updating, SQL DML Queries: SELECT Query and clauses, Index and Sequence in SQL, Views: Creating, Dropping, Updating using	6

	Indexes, Set Operations, Predicates and Joins, Set membership, Tuple Variables, Set comparison, Ordering of Tuples, Aggregate Functions, SQL Functions, Nested Queries, PL/SQL: Concept of Stored Procedures & Functions, Cursors, Triggers, Assertions, Roles and Privileges Case Study: Implementation of unit 1 case study using SQL/PLSQL.	
III	Relational Database Design Relational Model: Basic concepts, Attributes and Domains, CODD's Rules, Relational Integrity: Domain, Referential Integrities, Enterprise Constraints, Database Design: Features of Good Relational Designs, Normalization, Atomic Domains and First Normal Form, Decomposition using Functional Dependencies, Algorithms for Decomposition, 2NF, 3NF, BCNF. Case Study: Convert ERD of Unit 1 to Relational Database and apply Normalization.	6
IV	Database Transaction Management Transaction concept, Transaction states, ACID properties, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Cascaded Aborts, Recoverable and Non-recoverable Schedules, Concurrency Control: Lock-based, Time-stamp based Deadlock handling, Recovery methods: Shadow-Paging and Log-Based Recovery, Checkpoints. Case Study: Study of transaction Management in Postgre SQL.	7
V	NoSQL Databases Introduction to Distributed Database System- Advantages, disadvantages, CAP Theorem. Types of Data: Structured, Unstructured data & Semi-Structured Data; NoSQL Database: Introduction, need, Features, Types of NoSQL Databases: Key-value store, document store, graph, wide column stores; BASE Properties, Data Consistency model ACID Vs BASE, Comparative study of RDBMS and NoSQL, MongoDB (with syntax and usage): CRUD Operations, Indexing, Aggregation, MapReduce, Replication, Sharding. Case Study- Use of NoSQL databases for processing unstructured data from social media.	6
VI	Advances in Databases Emerging Databases: Active and Deductive databases, Main Memory databases, Semantic databases. Complex Data Types: Semi-Structured Data: Features of Semi-Structured Data Models, Nested Data Types: JSON, XML, Object Orientation: Object-Relational Database System, Table Inheritance, Object-Relational Mapping, Spatial Data: Geographic Data, Geometric Data.	5
	Total	36
Textbooks:		
<ol style="list-style-type: none"> 1 Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, 7th Edition, 2020 ISBN 978-0-07-802215-9. 2 Ivan Bayross, "SQL, PL/SQL the Programming Language of Oracle", BPB Publications, 2014 ISBN: 9788176569644. 3 Connally T, Begg C., "Database Systems- A Practical Approach to Design, Implementation and Management", Pearson Education, 5th Edition, 2010, ISBN 81-7808-861-4. 4 Pramod J. Sadalage and Martin Fowler, "NoSQL Distilled", Addison Wesley, ISBN 10: 0321826620, 2013, ISBN 13: 978-0321826626. 		
Reference Books:		
<ol style="list-style-type: none"> 1 C. J. Date, "An Introduction to Database Systems", Addison-Wesley, 8th Edition, 2004, ISBN 0321189566. 2 S. K. Singh, "Database Systems: Concepts, Design and Application", Pearson Education, 2009, ISBN 9788177585674. 3 Kristina Chodorow, Michael Dierolf, "MongoDB: The Definitive Guide", O'Reilly Publications, 3rd Edition, 2019 ISBN 9781491954461. 4 Kevin Roebuck, "Storing and Managing Big Data - NoSQL, HADOOP and More", Emereo Pty Limited, 2011, ISBN 1743045743, 9781743045749. 		

Program:	B. Tech. (Computer)			Semester:	IV		
Course:	Software Engineering			Code:	BCE4407		
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	IE	MTE	ETE	Total
3	-	3	3	20	30	50	100
Prior Knowledge of :							
<ul style="list-style-type: none"> a Computer Programming and Problem Solving b Computer Programming and Problem Solving is essential.							
Course Objectives:							
<ul style="list-style-type: none"> 1 To comprehend the principles of Software Engineering 2 To apply appropriate process model for specific software project development 3 To be acquainted with methods of capturing, specifying, and analysing software requirements. 4 To apply Design principles to software project development 5 To comprehend the UML diagrams 6 To be acquainted with agile process model. 							
Course Outcomes:							
After learning the course, students will be able to:							
<ul style="list-style-type: none"> 1 Comprehend the principles of Software Engineering. 2 Apply appropriate process model for specific software project development. 3 Get acquainted with methods of capturing, specifying, and analysing software requirements. 4 Apply Design principles to software project development. 5 Comprehend the UML diagrams. 6 Get acquainted with the agile process model. 							
Detailed Syllabus:							
Unit	Description						Duration (H)
I	Introduction: What is Software Engineering, Software Myth, Software engineering Knowledge-core Principles-Principles that guide each framework Activity, Software Development Life-cycle Requirement analysis, software design, coding, software testing, software maintenance, types of software maintenance. Case Study: Introduction to Safe Home.						6
II	Unified process: Software process Models. Generic process model-Prescriptive process model-Waterfall, Waterfall with Feedback-Incremental Process Model, Rapid Application Development (RAD) Process Model, Prototyping Process Model, Spiral Process Model, Comparison of Process Models for selection of appropriate process model for software development. Case Study: Safe Home.						6
III	Software Requirement Specification:						6

	Requirements Engineering- Problem analysis, Establishing the Groundwork-Eliciting Requirements- Developing use cases-Building the requirements model-Negotiating, validating Requirements-Requirements Analysis-Requirements Modeling Strategies. Case Study: Safe Home.	
IV	Design Process: Design concepts: Abstraction, Architecture, patterns, Separation of Concerns, Modularity, Information Hiding, Functional Independence, Refinement, Aspects, Refactoring.	6
V	Modelling with UML: Modelling Concepts and Diagrams - Use Case Diagrams - Class Diagrams - Interaction Diagrams - State chart Diagrams - Activity Diagrams - Package Diagrams - Component Diagrams - Deployment Diagrams - Diagram Organization- Diagram Extensions. Case Study: Safe Home.	6
VI	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.	6
	Total	36
Textbooks:		
<ol style="list-style-type: none"> 1 Roger S Pressman, "Software Engineering – A Practitioner’s Approach", Pearson Education, 7th Edition, 2010. 2 Ian Sommerville, "Software Engineering", 9th edition, 2010. 3 Unified Modeling Language User Guide, The (2nd Edition) (Addison-Wesley Object Technology Series), May 2005. 		
Reference Books:		
<ol style="list-style-type: none"> 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. 		

Program:	B. Tech. (Computer)			Semester:	IV		
Course:	Computer Networks Laboratory			Code:	BCE4408		
Teaching Scheme				Evaluation Scheme			
Practical	Tutorial	Credit	Hours	TW	PR	OR	Total
2	-	1	2	25	25	-	50
Objectives:							
<ol style="list-style-type: none"> 1 To establish communication among the computing nodes in various networking architectures . 2 Configure the computing nodes with understanding of protocols and technologies. 3 Use different communicating modes and standards for communication. 4 Use modern tools for network traffic analysis. 5 To learn network programming. 							
Outcomes:							
After learning the course, the students will be able to:							
<ol style="list-style-type: none"> 1 Understand working and architecture of college/ organization network. 2 Design network application by using various concepts of layered architecture. 3 Write program to analyze working of various protocols and packets. 4 Demonstrate LAN and WAN protocol behavior using Modern Tools. 5 Write a program for error control and error detection mechanisms. 6 Write a program to study the various header formats of protocols. 							
Guidelines for Student Journal							
<ul style="list-style-type: none"> • The laboratory assignments are to be submitted by student in the form of journal. Journal consists of Prologue, Certificate, Table of Contents, and Handwritten Write-up of each assignment (Title, Objectives, Theory- Concept in brief, Algorithm, Flowchart, Test cases, Date of Completion, Assessment grade/marks and assessor's sign, Conclusion). • Program codes with sample output of all performed assignments are to be submitted as softcopy. • As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided. Use of DVD containing student's programs maintained by lab In-charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory. 							
Guidelines for Assessment							
<ul style="list-style-type: none"> • Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. • Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness. 							
Guidelines for Laboratory Conduction							
<ul style="list-style-type: none"> • Set of suggested assignment lists is provided in groups- A, B, C and D. Each student must perform at least 3 assignments from group A, 2 from group B, 2 from group C and 3 from group D. • Operating System recommended: - 64-bit Open-source Linux or its derivative. • Programming tools recommended: - Open-Source C, C++, JAVA and PYTHON. • Programming tools like G++/GCC, Wireshark, Etheral and Packet Tracer. 							
Assign ment No.	Suggested List of Assignments						
GROUP A (Any 3)							
1	Study the college / organization network, networking devices and its working in detail. Study the college / organization Server functioning and security parameters. (If possible, plan visit to the server room)						
2	Write a program to implement Pulse Code Modulation Technique to transfer the data to another computer.						

3	Setup a wired LAN using Layer 2 Switch and then IP switch of minimum four computers. It includes preparation of cable, testing of cable using line tester, configuration machine using IP addresses, testing using PING utility and preparing server to send file to client. Demonstrate the PING packets captured traces using Wireshark Packet Analyzer Tool.
4	Write a program for error detection and correction for 7/8 bits ASCII codes using CRC.
GROUP B (Any 2)	
5	Write a program to capture and analyze following packet formats for wired network. 1. Ethernet 2. IP 3. TCP 4. UDP
6	Write a program to prepare TCP and UDP packets using header files and send the packets to destination machine in peer-to-peer mode.
7	Write a program using TCP sockets for wired network to implement: a Peer to Peer Chat Multiuser Chat (Use JAVA/PYTHON)
GROUP C (Any 2)	
8	Write a program using UDP sockets for wired network to implement: a Peer to Peer Chat Multiuser Chat (Use JAVA/PYTHON)
9	Write a program to simulate Go back N and Selective Repeat Modes of Sliding Window Protocol in peer-to-peer mode.
10	Write a program to demonstrate subnetting and find the subnet masks.
GROUP D (Any 3)	
11	Configure RIP/OSPF/BGP using packet Tracer.
12	Write a program for DNS lookup. Given an IP address input, it should return URL and vice-versa.
13	Installing and configure DHCP server.
14	Write a program to simulate the behaviour of link state routing protocol to find suitable path for transmission.
15	Develop an unsecured website, access it over HTTP. Now make the website secure, by implementing HTTPS only access to the website. You can use existing website as well. Clearly document the benefits of forcing the HTTPS only access to the website.
16	Implement "Geo Fencing", understand its working i.e. how to limit the access to the college applications to a specific geography only based on IP addresses and geo mapping.
Reference Books: <ol style="list-style-type: none"> 1. Kurose, Ross, "Computer Networking a Top-Down Approach Featuring the Internet", 8/E, 2021, ISBN-10: 0136681557, ISBN-13: 9780136681557, 2021, Pearson. 2. Andrew S. Tanenbaum, "Computer Networks", Pearson Education India, 6th Edition, 2021 ISBN: 9780136764052, 0136764053. 3. Fourauzan B., "Data Communications and Networking", 5th Edition, Tata McGraw- Hill Publications, 2013 ISBN: 1259064751 • 9781259064753. 	
Web references: - https://www.w3schools.com/java	

Program:	B. Tech. (Computer)			Semester:	IV		
Course:	Project Based Learning- II			Code:	BCE4409		
Teaching Scheme				Evaluation Scheme			
Practical	Tutorial	Credit	Hours	TW	OR	PR	Total
4	-	2	4	25	50	25	100

Course Objectives:

- 1 To understand the fundamental concepts of database management. These concepts include aspects of databasedesign, database languages, and database system implementation.
- 2 To provide a strong formal foundation in database concepts, technology, and practice.
- 3 To give systematic database design approaches covering conceptual design, logical design and an overview ofphysical design.
- 4 To learn a powerful, flexible and scalable general purpose database to handle big data.
- 5 To understand the systematic process of developing software applications for given requirements.

Course Outcomes:

After learning the course, students will be able to:

- 1 Design and develop Application considering requirements and using Database concepts
- 2 Apply Software Development Life cycle to develop Application considering requirements
- 3 Design E-R Model for given requirements and convert the same into database tables.
- 4 Design schema in appropriate normal form considering actual requirements
- 5 Write SQL queries and PL/SQL Code block for given requirements, using different SQL and PL/SQL concepts
- 6 Use advanced database Programming concepts like MongoDB.

Guidelines for Instructor for Laboratory Conduction:

- Instructor must frame assignments on all concepts covered in Group A and Group B.

Assignment No.	Suggested List of Assignments
GROUP A - SQL & PL/SQL	
1	Decide a case study related to real time application in group of 2-3 students and formulate a problem statement for application to be developed. Propose a Conceptual Design using ER features using tools like ERD plus, ER Win etc. (Identifying entities, relationships between entities, attributes, keys, cardinalities, generalization, specialization etc.) Convert the ER diagram into tables on paper and propose a normalize Relational data model. Note: Student groups are required to continue same problem statement throughout all the assignments to design and develop an application as a part Mini Project. Further assignments will be useful for students to develop a backend for system. To design front end interface students should use the different concepts learnt in the other subjects also.
2	a Design and Develop SQL DDL statements which demonstrate the use of SQL objects such as Table, View, Index, Sequence, Synonym, different constraints etc. b Write at least 10 SQL queries on the suitable database application using SQL DML statements. Note: I. Instructor will design the queries which demonstrate the use of concepts like Insert, Select, Update, delete with operators, functions, and set operator etc.

	<p>II. Instructor will suggest students to write similar queries for their application to be developed apart from assignment framed.</p>
3	<p>Write at least 10 SQL queries for suitable database application using SQL DML statements. Note: I Instructor will design the queries which demonstrate the use of concepts like all types of Join, Sub-Query and View</p> <p>Instructor will suggest students to write similar queries for their application to be developed apart from assignment framed.</p>
4	<p>Unnamed PL/SQL code block: Use of Control structure and Exception handling is mandatory. Suggested Problem statement: Consider Tables: 1 Borrower (Roll_no, Name, DateofIssue, NameofBook, Status) 2 Fine (Roll_no, Date, Amt) Accept roll_no & name of book from user.</p> <ul style="list-style-type: none"> • Check the number of days (from date of issue), • If days are between 15 to 30 then fine amount will be Rs 5 per day. • If no. of days > 30, per day fine will be Rs 50 per day & for days less than 30, Rs. 5 per day. • After submitting the book, status will change from I to R. • If condition of fine is true, then details will be stored into fine table. • Also handles the exception by named exception handler or user define exception handler. Note: I Instructor will Frame the problem statement for writing PL/SQL block in line with above statement. <p>Instructor will suggest students to write similar block for their application to be developed if required.</p>
5	<p>Named PL/SQL Block: PL/SQL Stored Procedure and Stored Function.</p> <p>Write a Stored Procedure namely proc_Grade for the categorization of student. If marks scored by students in examination is ≤ 1500 and marks ≥ 990 then student will be placed in distinction category if marks scored are between 989 and 900 category is first class, if marks 899 and 825 category is Higher Second Class</p> <p>Write a PL/SQL block to use procedure created with above requirement. Stud_Marks(name, total_marks) Result(Roll, Name, Class)</p> <p>Note: I Instructor will Frame the problem statement for writing stored procedure & Function in line with above statement.</p> <p>Instructor will suggest students to write similar named block for their application to be developed if required</p>
6	<p>Cursors: (All types: Implicit, Explicit, Cursor FOR Loop, Parameterized Cursor)</p> <p>Write a PL/SQL block of code using parameterized Cursor that will merge the data available in the newly created table N_RollCall with the data available in the table O_RollCall. If the data in the first table already exist in the second table, then that data should be skipped.</p> <p>Note: I Instructor will Frame the problem statement for writing PL/SQL block using all types of Cursors in line with above statement.</p> <p>Instructor will suggest students to write similar block for their application to be developed if required</p>
7	<p>Database Trigger (All Types: Row level and Statement level triggers, Before and After Triggers).</p> <p>Write a database trigger on Library table. The System should keep track of the records that are being updated or deleted. The old value of updated or deleted records should be added in Library Audit table.</p>
	<p>Note: I Instructor will Frame the problem statement for writing PL/SQL block for all types of Triggers in line with above statement.</p> <p>Instructor will suggest students to write similar block for required types of triggers for their application to be developed.</p>

8	Write a program to implement MYSQL/Oracle database connectivity with any front-end language to implement Database navigation operations (add, delete, edit etc)
GROUP B - NoSQL Database	
9	Design and Develop MongoDB Queries using CRUD operations. (Use CRUD operations, SAVE method, logical operators etc)
10	Design and Develop MongoDB Queries using aggregation and indexing with suitable example using MongoDB.
11	Implement Map reduces operation with suitable example using MongoDB.
12	Write a program to implement MongoDB database connectivity with any front-end language to implement Database navigation operations (add, delete, edit etc)
GROUP C - Mini Project	
13	<p>Using the database concepts covered in Group A & Group B assignments, DBMS Theory course and using concepts in Proficiency Course-1 & Software Engineering, develop application with following details:</p> <ul style="list-style-type: none"> • Follow the same Problem statement decided in Assignment -1 of Group-AF Follow the Software Development Life cycle and other concepts learnt in Software Engineering Course throughout the implementation. • Prepare a Software Requirement Specification Document (SRS) for your application. (to be completed as case study in Software Engineering course for the problem statement decided in Assignment -1 of Group A) • Design & demonstrate the system using some UML Diagrams. (to be completed as case study in Software Engineering course for the problem statement decided in Assignment -1 of Group A) • Develop application considering: <ul style="list-style-type: none"> ○ Front End: Java/Perl/PHP/Python/Ruby/.net/any other language learnt in Proficiency Course-1 ○ Backend: MongoDB/MYSQL/Oracle (to be kept ready parallel while executing assignments of Group A & Group B) • Test and validate application using Manual/automation testing • Student should develop application in group of 2-3 students and submit the Project Report which will consist of documentation related to different phases of Software Development Life Cycle: <ul style="list-style-type: none"> ○ Title of the Project, Abstract, Introduction ○ Software Requirement Specification ○ Conceptual Design using ER features, Relational Model in appropriate Normalize Form. <ul style="list-style-type: none"> ○ UML Design ○ Graphical User Interface, Source Code ○ Testing document ○ Conclusion <p>Note:</p> <ul style="list-style-type: none"> ○ Instructor should maintain progress report of mini project throughout the semester from project group and assign marks as a part of the term work ○ Oral examination will be on the Software Engineering concepts learnt in Software Engineering Course and used in above development, Mini Project Implementation and assignments covered in Group A & Group B. ○ Practical examination will be on assignments given in Group A & Group B only ○ Mini Project in this course should facilitate the Project Based Learning among students.
<p>Reference Books:</p> <ol style="list-style-type: none"> 1 Ivan Bayross, "SQL, PL/SQL the Programming Language of Oracle", BPB Publications, 2014 ISBN: 9788176569644. 2 Pramod J. Sadalage and Martin Fowler, "NoSQL Distilled", Addison Wesley, ISBN 10: 0321826620, 2013, ISBN 13: 978-0321826626. 3 Kristina Chodorow, Michael Dierolf, "MongoDB: The Definitive Guide", O'Reilly Publications, 3rd Edition, 2019 ISBN 9781491954461. 4 Roger Pressman, "Software engineering: a practitioner's approach", McGraw Hill Education, 2017, 7th Edition ISBN: 978-0-07-337597-7. 	

Program:		B. Tech. (Computer)			Semester :		IV	
Course :		Neural Network and Fuzzy Logic Control (Open Elective-I)			Code :		BAS4606	
Teaching Scheme				Evaluation Scheme				
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	Total	
3	-	-	3	20	30	50	100	
Prior Knowledge: Nil								
Course Objectives: This course aims at enabling students to get acquainted with, <ol style="list-style-type: none"> 1. Knowledge of Neural Networks and Fuzzy Logic Control and their use for controlling real time systems. 2. Knowledge about fuzzy set theory to solve various engineering problems. 								
Course Outcomes: After learning the course, the students will be able to: <ol style="list-style-type: none"> 1. Model a Neuron and Express Neural Network. 2. Apply feedback networks to study Inverted Pendulum, Articulation Control. 3. Implement an artificial neural network using the NN simulation toolbox. 4. Apply concepts of fuzzy logics in Fuzzification and Defuzzification. 5. Appl fuzzy logic control in Pattern recognition and Home Heating system. 6. Implement Fuzzy Logic Toolbox in fuzzy logic control. 								
Detailed Syllabus:								
Unit	Description						Duration (H)	
I	Architecture of Neural Network: Introduction, Biological neuron, Artificial neuron, Neuron modeling, Basic learning rules, Single layer, Multilayer feed forward network, Back propagation, Learning factors.						6	
II	Neural Networks For Control: Feedback networks, Discrete time hop field networks, Schemes of neuro-control, Identification and control of dynamical systems, Case studies-Inverted Pendulum, Articulation Control.						6	
III	Problem Solving-I: Neural Network (NN) Toolbox, NN Simulink Demos, Neural Network (ANN) implementation, NN Tool Artificial Neural Network (ANN) implementation, Application of NN to Control System.						6	
IV	Fundamental of Fuzzy Logic: Classical sets, Fuzzy Sets, Membership function, Cardinality of fuzzy set, Fuzzy complement, Fuzzy union & intersection, Fuzzy Relation, Fuzzification, Defuzzification, Fuzzy Rule.						6	
V	Fuzzy Logic Control: Introduction, Knowledge based system, Decision making Logic, Fuzzy optimization, Adaptive fuzzy systems, Introduction to generate a genetic algorithm, Applications to Pattern recognition, Home Heating system.						6	
VI	Problem Solving-II: Fuzzy Logic Toolbox, Fuzzy Logic Simulink Demos, Fuzzy Logic Controller (FLC) implementation, Simulink Fuzzy Logic Controller (FLC) implementation, Applications of FLC to Control System.						6	
Total						36		
Text Books: <ol style="list-style-type: none"> 1. Kosko, B, "Neural Networks and Fuzzy Systems: A Dynamical Approach to Machine Intelligence", PrenticeHall, NewDelhi, 2004. 2. Ross T. J. , "Fuzzy logic with engineering applications (Vol. 2)", New York: Wiley, 2004, ISBN: 9783030375478 								
Reference Books: <ol style="list-style-type: none"> 1. Jack M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishing Co., Boston, 2002. 2. Zimmerman H.J., "Fuzzy set theory and its Applications", Kluwer Academic Publishers Dordrecht, 2001. 3. Driankov,Hellendroonb, "Introduction to fuzzy control", Narosa Publishers,2001. 4. G Klir, B Yuan, "Fuzzy sets and fuzzy logic : Theory and application", PHI, ISBN: 5. LauranceFausett, Englewood cliffs, N.J., "Fundamentals of Neural Networks", PearsonEducation, New Delhi, 2008. 								
E-source: Online course "Fuzzy logic and Neural Network" by Prof. Dilip Kumar Pratihar, IIT Kharagpur. https://nptel.ac.in/courses/127/105/127105006/								

Program:	B. Tech. (Computer)			Semester :	IV				
Course :	Professional skills for Engineers (HSMC)			Code :	BHM4101				
Teaching Scheme				Evaluation Scheme					
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	TW	PR	Total
2	-		2	30	-	20	-	-	50
Pre-requisite: Nil									
Objectives:									
<ol style="list-style-type: none"> To introduce to students the fundamentals of effective communication and barriers in communication. To introduce them to the concept of verbal and non-verbal communication and importance of Body language To introduce to students the skills to prepare and deliver effective presentations and learn tricks of mastering group discussions. To sensitize students to their behaviour in corporates by allowing them to understand the basics of corporate etiquettes. 									
Outcomes:									
After learning the course, the students will be able to:									
<ol style="list-style-type: none"> Evaluate the barriers in communication and accordingly master the skills of communication across culture at workplace. Demonstrate effective verbal as well as non-verbal communication skills in both social and professional contexts Develop practically deployable skill set involving effective presentations and handling group discussions to hone the opportunities of employability and excel in the professional environment. Demonstrate skills for effectively handling the interviews and and ability to handle casual and formal situations in terms of personal grooming, dining and other corporate etiquettes. 									
Detailed Syllabus:									
Unit	Description								Duration (H)
1	Introduction and Fundamentals of Communication: Need for effective communication, Functions of Communication, Communication Cycle, Levels of communication; Flow of communication Barriers to Effective Communication: Miscommunication; Noise; Types of barriers; Communication across Culture								06
2	Verbal, Nonverbal communication and Body language: Forms of Communication- Verbal and Non-verbal, their role and composition in overall communication; Effective use of body language, Listening Vs Hearing								06
3	Presentation Skills: 4Ps (Planning, Preparation, Practice, Presentation), Outlining; Effective use of A/V aids and Modes of Delivery Mastering Group Discussion skills: Skills evaluated in Group discussion, Types of Group discussion, Do's and Don'ts in Group Discussion								06
4	Interview Skills: Self Introduction, Do's and Don'ts during Interview Corporate Etiquettes: Definition and importance of Etiquette, Dressing Etiquettes, Dining Etiquettes, Telephonic etiquette, Business card Etiquette, Email etiquette								06

	Total	24
Text Book: 1. R.Gajendra Singh Chauhan and Sangeeta Sharma, “Soft Skills-An integrated approach to maximize personality”, Wiley Publication, ISBN: 987-81-265-5639-7		
Reference Books: 1. Muralikrishna C., Sunita Mishra “Communication Skills for Engineers” 2nd edition, Pearson, New Delhi 2010 2. Indrajit Bhattacharya, “An Approach to Communication Skills”, Dhanpat Rai, Delhi, 2008 3. Simon Sweeney, “English for Business Communication”, Cambridge University Press. 4. Sanjay Kumar and Pushpa Lata, “Communication Skills”, Oxford University Press.		

Program:	B. Tech. (Computer)			Semester:	IV		
Course:	C# .Net (Proficiency Course -I)			Code:	BCE4911A		
Teaching Scheme				Evaluation Scheme			
Practical	Tutorial	Credit	Hours	TW	PR	OR	Total
2	-	-	2	-	-	-	-

Prior Knowledge of:

1. Decision control structures, loop control structures, arrays, Functions, pointers, structure and union, searching and sorting techniques.

is essential.

Course Objectives:

- 1 To understand the MS.NET Framework.
- 2 To understand basic of c# programming.
- 3 To learn object-oriented Programming using c#.
- 4 To learn and understand Database Programming Using ADO.NET.

Course Outcomes:

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

- 1 Understand the use of Microsoft .Net Framework.
- 2 Write the basic programs using C# programming.
- 3 Demonstrate OOP concepts using C#.
- 4 Understand assemblies & deployment in .Net.
- 5 Develop GUI based applications using C# components.
- 6 Demonstrate the concepts of Database connectivity using ADO .Net concepts.

Guidelines:

- The laboratory assignments are to be submitted by students in the form of a journal.
- Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment.
- Each assignment write-up should have Title, Objectives, Outcomes, Theory- Concept in brief, Algorithm, Flowchart, Test cases, Conclusion, Assessment grade/marks and assessor's sign.
- Program codes with sample output of all performed assignments are to be submitted as softcopy.

Assignment No.	Suggested List of Assignments
1	Assignment will be conducted based on following topics. MS.NET Framework Introduction: The .NET Framework an Overview, Framework Components, Framework Versions, Types of Applications which can be developed using MS.NET, MS.NET Base Class Library, MS.NET Namespaces, The Common Language Runtime (CLR) ,MS.NET Memory Management / Garbage Collection.
2	Assignment will be conducted based on following topics. C # Language Syntax: Why Datatypes Global, Stack and Heap Memory, Common Type System, Reference Type and Value Type, Datatypes & Variables Declaration, Implicit andExplicit Casting, Checked and Unchecked Blocks, Overflow Checks.
3	Assignment will be conducted based on following topics. C # Language Syntax: Enum and Constant, Operators, Control Statements, Working withArrays, Working with Methods, Pass by value and by reference and out parameters.

4	<p>Assignment will be conducted based on following topics.</p> <p>OOPs-Concept: Learning about Class, Object, Component, Encapsulation, Inheritance, Polymorphism & Object Creation and Instantiation, programming Encapsulation, Inheritance, Interface & Polymorphism, What is a DLL and how is it different from EXE.</p>
5	<p>Assignment will be conducted based on following topics.</p> <p>Developing GUI Application: Basic Controls, Panel & Layouts, Drawing and GDI Devices, MenuStrip, Toolbar Strip and ContextMenuStrip, Multiple Document Interface (MDI), Building Login Form, Using Components like Timer, Filesystem Watcher, Process, Background Worker, Working with Advanced Controls like TreeView and ListView.</p>
6	<p>Assignment will be conducted based on following topics.</p> <p>Database Programming Using ADO.NET: Introduction and Evolution of ADO.NET, Howto implement Login facility with database, Writing Provider Independent Code.</p>
<p>Textbooks:</p> <ol style="list-style-type: none"> 1 Arthur Gittleman, "Computing with C# and the .Net Framework", Jones and Bartlett Publishers, 2nd Edition, 2011, ISBN 13: 978-1449615505. 2 Joyce Farrell "Microsoft Visual C#: An Introduction to Object-Oriented Programming (Looseleaf)", Cengage Learning, 7th Edition, 2018, ISBN 13: 9781337685771. 	
<p>Reference Books:</p> <ol style="list-style-type: none"> 1 Ben Albahari, Peter Drayton & Brad Merrill, "C# Essentials", O'Reilly, 2nd Edition, 2002, ISBN-13 978-0596003159. 2 Joseph Albahari & Ben Albahari, "C# 5.0 In a Nutshell: The Definitive Reference", O'Reilly, 5th Edition, 2006, ISBN-13 978-1449320102. 	

Program:	B. Tech. (Computer)			Semester:	IV		
Course:	Java Programming (Proficiency Course -I)			Code:	BCE4911B		
Teaching Scheme				Evaluation Scheme			
Practical	Tutorial	Credit	Hours	TW	PR	OR	Total
2	-	-	2	-	-	-	-

Prior Knowledge of:

1. Decision control structures, loop control structures, arrays, Functions, pointers, structure and union, searching and sorting techniques.

is essential.

Course Objectives:

- 1 To understand the basic concepts of Java.
- 2 To learn object-oriented programming using Java.
- 3 To learn and understand exception handling and wrapper classes.
- 4 To learn and understand I/O packages and threading in Java.
- 5 To learn front end design using SWING and JavaFX.

Course Outcomes:

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

- 1 Understand the basic concepts of Java programming.
- 2 Understand the Object-Oriented Programming concepts in Java.
- 3 Apply the concepts of Object-Oriented Programming to solve real time problems.
- 4 Use the concepts of exception handling, packages and collection in the Java environment.
- 5 Use I/O packages to perform I/O operations in Java programs.
- 6 Design and develop java applications using SWING and JavaFX.

Guidelines:

- The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment.
- Each assignment write-up should have Title, Objectives, Outcomes, Theory- Concept in brief, Algorithm, Flowchart, Test cases, Conclusion, Assessment grade/marks and assessor's sign.
- Program codes with sample output of all performed assignments are to be submitted as softcopy.

Assignment No.	Suggested List of Assignments
1	Assignment will be conducted based on following topics. Introduction to Java programming: The Java Virtual Machine, Variables and data types, Conditional and looping constructs, Arrays.
2	Assignment will be conducted based on following topics. Object-oriented programming with Java Classes and Objects: Fields and Methods, Constructors, Overloading methods, Garbage collection, Nested classes.
3	Assignment will be conducted based on following topics. Inheritance: Overriding methods, Polymorphism, Making methods and classes final, Abstract classes and methods, Interfaces.

	Exception handling with try-throw-catch-finally constructs: The Exception class, The Objectclass: Cloning objects, The JDK LinkedList class, Strings, Strings Conversions.
4	<p>Assignment will be conducted based on following topics. Collection Framework: List, Set & Map interfaces, Vector, ArrayList, LinkedList, Hashtable, HashMap, TreeMap, Iterator, Enumerator, Que, Deque, SortedQue, HashSet, TreeSet, LinkedHashSet, Compare and Comparable. Introduction of Generics.</p> <p>Working with types: Wrapper classes, Enumeration interface Packages Package access, Documentation comments.</p>
5	<p>Assignment will be conducted based on following topics. The I/O Package: InputStream and OutputStream classes, Reader and Writer classes, Threads: Synchronization</p>
6	<p>Assignment will be conducted based on following topics. SWING (JFC): Introduction Diff B/W AWT and SWING, Components hierarchy, Panes, Individual Swings components J Label, JButton, JTextField, JTextAres. JavaFX: JavaFX Architecture, JavaFX Program Structure, Shapes, Effects, LayoutComponents, Properties and Bindings, Basic UI Controls, Graphics and Animation.</p>
<p>Textbooks:</p> <ol style="list-style-type: none"> 1 Herbert Schildt, "Java - The Complete Reference", The McGraw-Hill Education, 11th Edition, 2018, 978-1260440232. 2 E. Balagurusamy, "Programming with Java" McGraw Hill Education India, 6th Edition, 2019, 9789353162344. 	
<p>Reference Books:</p> <ol style="list-style-type: none"> 1 D.T. Editorial Services, "Java 8 Programming Black Book", Dreamtech Press India Pvt. Ltd., Paperback, 2015, 9789351197584. 2 Ken Arnold, James Gosling and David Holmes, "The Java Programming Language", Addison-Wesley, 4th Edition, 2005, 0321349806. 	

Program:	B. Tech. (Computer)				Semester:	IV				
Course :	Life Skills-IV				Code :	BHM4940				
Teaching Scheme				Evaluation Scheme						
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	TW	PR	OR	Total
-	2	-	-	-	-	-	-	-	-	-
Prior knowledge: Nil										
Objectives:										
<ol style="list-style-type: none"> To learn about the social functioning and diverse culture in the country. To be aware and improve interpersonal behavioural patterns. To inculcate caring and serving qualities towards family, society and environment at large. 										
Outcomes:										
After Successfully completing the course the students should be able to:										
<ol style="list-style-type: none"> Apply social work practices in the context of diverse cultures. Develop a broad understanding of Indian culture through various art forms. Apply effective ways of interpersonal behavioural patterns eliminating their unhelpful thoughts, feelings and actions. Develop skills which are necessary to initiate ideas and pursue them for holistic development of the individual. 										
Detailed Syllabus:										
Unit	Description									Duration (H)
1.	<p>Social Welfare Environment awareness such as Tree Plantation, Natural resources awareness etc, Donation Camp, Visit to Orphanage, Old Age home and Villages, Contribution in social activity like Pani Foundation, Swaccha Bharat Abhiyan, Save Girl Child/Animals/Birds/Trees etc., Activity based on societal projects / Project Exhibitions etc.</p> <p>Cultural Awareness Divisions of Indian classical music: Hindustani and Carnatic, Dances of India, Various Dance forms: Classical and Regional, Rise of modern theatre and Indian cinema.</p> <p style="text-align: center;">or</p> <p>Transaction Analysis Introduction to TA, Basic Assumptions of TA, Theory of Personality Ego States, Strucural and Functional, Ego States Diagnosis, Egogram, Structural Pathology, Contamination, Theory of Communication, Types of Transactions, Strokes, Stroke Economy, Theory of Life Positions, Injunctions</p>									12
2.	<p>Caring and service Hospital Caring, Personal Safety, First Aid, Disaster Management Gardening, Organic farming, Cooking, etc</p>									12
	Total									24
Reference Books:										
<ol style="list-style-type: none"> K. Singh, "An introduction to Social Work", 14 April 2011. Bishnu Mohan Dash, Mithilesh Kumar, D. P. Singh, Siddheshwar Shukla, "Indian Social Work", 1 October 2020. Martin Davies, "Social work with Children and Families", 20 March 2012. Anita Kainthla, "Baba Amte – A Biography", 1 January 2006. Aroup Chatterjee , "Mother Teresa – The untold story", 1 January 2006. Improving Behaviour and Raising Self-Esteem in the Classroom, A Practical Guide to Using Transactional Analysis, Giles Barrow, Emma Bradshaw, Trudi Newton, David Fulton Publishers, 1 October 2001. Transactional Analysis, 100 Key Points and Techniques, Mark Widdowson, 8 September 2009. Benjamin Colodzin, "Helping ourselves by Helping Others", 3 August 2020. Smith Mark K. "The Art of Helping Others", Jessica Kingsley Publishers,15 April 2008. Chip Heath, "Decisive: How to Make Better Choices in Life and Work", March 26, 2013. 										

Program:	B. Tech. (Computer)			Semester:	IV		
Course :	Constitution of India (Audit Course- I)			Code :	BHM9962		
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	Total
1	-	-	-	-	-	-	-
Prior knowledge: Nil							
Course Objectives:							
<ol style="list-style-type: none"> To enable the student to understand the importance of constitution To identify individual role and ethical responsibility towards nation. To understand human rights and its implications To know about central and state government functionalities in India. 							
Course Outcomes:							
After learning the course, the students will be able to:							
<ol style="list-style-type: none"> Understand the functions of the Indian government and get acquainted with knowledge of Constitutional Amendments. Identify and explore the basic features, modalities about Indian constitution and assessment of the Parliamentary System in India. Differentiate and relate the functioning of Indian Political system at the Central and State level. Comprehend the fundamental rights and abide the rules of the Indian constitution. 							
Detailed Syllabus:							
Unit	Description						Duration (H)
1.	Introduction to Constitution: Meaning of the constitution law and constitutionalism, making of constitution, Salient features and characteristics of the Constitution of India, Preamble, Fundamental Rights, Directive Principles of State Policy, Fundamental Duties and it's legal status, Citizenship.						3
2.	System of Government- Centre & State level and local level Structure and Function of Central Government, President, Vice President, Prime Minister, Cabinet, Parliament, Supreme Court of India, Judicial Review, Federal structure and distribution of legislative and financial powers between the Union and the States, local self-government						3
3.	Judiciary: Governor, Chief Minister, Cabinet, State Legislature Judicial System in States, High Courts and other Subordinate Courts,Parliamentary Form of Government in India.						3
4.	Constitution Functions: Indian Federal System and it's characteristics, Center& State Relations, President's Rule, ConstitutionalAmendmentsandpowers, Constitutional Functionaries,Emergency Provisions, Assessment of working of the Parliamentary System in India						3
	Total						12
Text Books:							
1. Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi,24th edition, 2020, ISBN-109388548868							

2. Clarendon Press, Subhash C, Kashyap, "Our Constitution: An Introduction to India's Constitution and constitutional Law", NBT, 5th edition, 2014, ISBN-9781107034624

Reference Books:

1. **Maciver and Page, "Society: An Introduction Analysis ", Laxmi Publications, 4th edition, 2007, ISBN-100333916166**
2. **PM Bhakshi, "The constitution of India", Universal Law Publishing - An imprint of Lexis Nexis, 14th edition, 2017, ISBN-108131262375**

Vision and Mission of Computer Engineering Department

Vision

To be a Premier Hub in Computer Engineering in Education and Research.

Mission

To build technologically competent and ethically strong individuals for serving the needs of industry and society by providing state-of-the-art resources, opportunities for Learning and Research in Computer Engineering.

PHOTOGRAPH OF BoS COMPUTER ENGINEERING MEETING

