Department of Computer Science and Engineering
III Semester B.E. (CSE)
Scheme and Syllabus

Sl. No	Category	Subject Code	Subject Title	Credits	HOURS/ WEEK			EXAMINATION MARKS		
					L	T	P	CIE	SEE	Total
1	BSC	21UMA301C	Numerical Techniques and Integral Transforms	3	3	0	0	50	50	100
2	PCC	21UCS307C	Digital Systems	3	3	0	0	50	50	100
3	PCC	21UCS302C	Computer Organization	3	3	0	0	50	50	100
4	PCC	21UCS303C	Data Structures	4	3	2	0	50	50	100
5	PCC	21UCS304L	Digital Systems Lab	1	0	0	2	50	50	100
6	PCC	21UCS305L	Data Structures Lab	1	0	0	2	50	50	100
7	AEC	21UCS306C	Professional Communication	1	0	2	0	100	_	100
8	UHV	21UHS324C	Universal Human Values II	1	1	0	0	50	50	100
9	HSMC	21UHS321C	Constitution of India	1	1	0	0	50	50	100
		21UMA300M	Bridge Course Mathematics-I *	0	3	0	0	50	50	100
*Only for Lateral Entry students			**Total**	**18**	**14**	**4**	**4**	**500**	**400**	**900**

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – III

Numerical Techniques and Integral Transforms

Course Code:	**21UMA301C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	03	Hours	40

Course objectives:

- To understand the numerical methods of solving algebraic, transcendental equations.
- To acquire the knowledge about various methods of interpolation
- To understand the basic concepts of numerical differentiation, numerical integration and numerical solutions of ordinary differential equations.
- To understand concepts of Fourier series, Fourier transforms, and z-transforms.

Unit -1 (10 hours)

Numerical Analysis-I

Introduction to root finding problems, Bisection Method, Newton-Raphson method. Finite differences, forward and backward difference operators (no derivations on relations between operators) Newton-Gregory forward and backward interpolation formulae. (Without proof), Lagrange's and Newton's divided difference interpolation formulae (without proof).

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit II (10 Hours)

Numerical Analysis-II

Numerical differentiation using Newton's forward and backward formulae-problems. Trapezoidal rule, Simpson's one third rule, Simpson's three eighth rule and Weddle's rule (no derivation of any formulae)-problems. Euler's and Modified Euler's method, Runge-Kutta 4th order method.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit III (10 Hours)

Fourier series

Periodic functions, Conditions for Fourier series expansions, Fourier series expansion of continuous and functions having finite number of discontinuities, even and odd functions. Half-range series, practical harmonic analysis.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit IV (10 Hours)

Fourier transforms and z-transforms

Infinite Fourier transforms and inverse Fourier transforms- simple properties, Fourier sine and Fourier cosine transforms, Inverse Fourier sine and cosine transforms. Z-transforms-definition, standard forms, linearity property, damping rule, shifting rule-problems. Inverse Z-transforms.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Course outcomes:

At the end of the course the student will be able to:

- Solve engineering problems using non-linear equations and interpolation techniques.
- Solve problems using numerical differentiation and numerical integration.
- Solve ordinary differential equations using numerical methods.
- Solve Problems using the Fourier series.
- Solve problems using the basic concepts of Fourier transforms and z –transforms.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and

				Year
Reference Books:				
1	Numerical Methods for Engineers	Steven C Chapra &Raymond P Canale		
2	Higher Engineering Mathematics	Dr. B.S. Grewal	Khanna Publishers, New Delhi	
3	Advanced Engineering Mathematics	H. K. Das	Chand & company Ltd, Ram Nagar, New Delhi	
4	Advanced Engineering Mathematics	E Kreyszig	John Wiley & Sons	

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
Sl.No	**Programme Outcomes / Course Outcomes**															
The students will be able to:																
1	Solve engineering problems using non-linear equations and interpolation techniques.	1	--	--	--	--	--	--	--	--	--	--	--	_	--	--
2	Solve problems using numerical differentiation and numerical integration	1	2	--	--	--	--	--	--	--	--	--	--			--
3	Solve ordinary differential equations using numerical methods	1	--	--	--	--	--	--	--	--	--	--	--		--	--
4	Solve Problems using the Fourier series.	1	2	---	--	--	--	--	--	--	--	--	--			---
5	Solve problems using the basic concepts of Fourier transforms and z–transforms	1	--	--	--	---	--	--	--	--	--	--	--		--	--

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – III

Bridge Course Mathematics-I (Mandatory)

Course Code:	**21UM300M**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	--	Hours	40

Unit -1 (10 hours)

Differential Calculus:

Review of elementary calculus, Polar curves - angle between the radius vector and tangent, angle between two curves, pedal equation. Taylor's and Maclaurin's series expansions for one variable (without proof) problems

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit II (10 Hours)

Partial differentiation: Introduction to function of several variables, Partial derivatives; Euler's theorem - problems. Total derivatives-differentiation of composite functions. Jacobians-problems

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit III (10 Hours)

Integral Calculus:

Multiple integrals: Evaluation of double and triple integrals. Area bounded by the curve.

Beta and Gamma functions: Definitions, Relation between beta and gamma functions-problems.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit IV (10 Hours)

Vector Differentiation: Scalar and vector fields**.** Gradient, directional derivative; curl and divergence-physical interpretation; solenoidal and irrotational vector fields- problems

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Course outcomes:

At the end of the course the student will be able to:

- Apply the concepts of polar curves to solve Engineering problems
- Apply the knowledge of partial differentiation to solve Engineering problems.
- Apply the concepts of multiple integrals and their usage in computing the area and volumes.
- Evaluate improper integrals using beta and gamma functions.
- Apply the knowledge of differentiation of vectors to solve the engineering problems.

Sl No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Reference Books:				
1	Higher Engineering Mathematics	Dr. B.S. Grewal	Khanna Publishers, New Delhi	2017
2	Advanced Engineering Mathematics	E Kreyszig	John Wiley & Sons , Pvt.Ltd	2014
3	Elementary Differential Equations by	Earl D. Rainville and Phillip E, Bedient		Sixth Edition
4	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons	2014

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
Sl.No	**Programme Outcomes / Course Outcomes**															
The students will be able to:																
1	Apply the concepts of polar curves to solve Engineering problems	1	2	--	--	--	--	--	--	--	--	--	--	--	--	--
2	Apply the knowledge of partial differentiation to solve Engineering problems	1	2	--	--	--	--	--	--	--	--	--	--	--	--	--
3	Apply the concepts of multiple integrals and their usage in computing the area and volumes	1	2	--	--	--	--	--	--	--	--	--	--	--	--	--
4	Evaluate improper integrals using beta and gamma functions.	1	2	---	--	--	--	--	--	--	--	--	--	--	--	--
5	Apply the knowledge of differentiation of vectors to solve the engineering problems.	1	2	--	--	---	--	--	--	--	--	--	--	--	--	--

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – III

Digital Systems

Course Code:	**21UCS307C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	03	Hours	40

Course objectives:

1. Make use of simplifying techniques in the design of combinational circuits.
2. Illustrate combinational and sequential digital circuits.
3. Demonstrate the use of flip flops.
4. Design and test registers and counters.

Unit -1 (10 hours)

Boolean algebra and Combinational Circuits: Boolean algebra definition, Principle of Duality, Boolean algebra theorems, Boolean formulas and functions, Normal forms. Minterm canonical form, m-notation, Maxterm Canonical form, M-notation.

Manipulation of Boolean expressions. Gates and combinational circuits. Incomplete Boolean functions and don't care conditions, Additional Boolean operations and Gates.

Revised Bloom's Taxonomy Level L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit II (10 Hours)

Simplification of Boolean expressions: Karnaugh-maps, Use of Karnaugh-maps to minimize Boolean Expressions. Minimal Expressions of Incomplete Boolean Functions.

The Quine-McCluskey and Decimal methods for generating prime implicants and prime implicates. Map Entered Variables (MEV)

Revised Bloom's Taxonomy Level L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit III (10 Hours)

Logic Design using MSI Components: Binary Adders and Subtractor, Comparators, Decoders, Encoders, Multiplexers.

Flip Flops and its Applications: Basic bistable element, Latches: SR Latch, S'R' Latch, Gated SR Latch, Gated D Latch, Master Slave SR and JK flip-flops, Master Slave D and T Flipflops, Edge Triggered flip-flops, Characteristic Equations.

Revised Bloom's Taxonomy Level L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit IV (10 Hours)

Registers: Serial In Serial Out, Circular, Parallel in Parallel Out, Parallel In Serial Out, Universal Shift Registers.

Counters: Binary Ripple Counter, Synchronous Binary Counters, Mod and Ring counters. Design of Synchronous Counters.

HDL implementations of combinational and sequential circuits.

Revised Bloom's Taxonomy Level L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Course outcomes:

At the end of the course the student will be able to:

- Demonstrate the understanding of Boolean algebra.
- Describe the working of Combinational circuits.
- Apply the Boolean theorems, K-Map, Q-M and VEM methods to simplify Boolean expressions.
- Describe the working of Sequential circuits and its applications.
- Simulate combinational circuits using HDL programming

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference books				
1	Digital Principles and Design	D.D. Givone	McGraw Hill.	8th Edition, 2017
2	Logic Design - A simplified approach	R. D. Sudhakar Samuel	Sanguine Technical Publications	Revised Edition, 2005
3	Digital Principles and applications'	Malvino, Leach and Saha	McGraw Hill.	6th Edition, 2007
4	Fundamental of digital Logic with Verilog Design	Stephen Brown & Zvonko Vranesic	Tata McGraw Hill	2nd Edition, 2002

Web links and Video Lectures:

1. https://archive.nptel.ac.in/courses/108/105/108105132
2. https://archive.nptel.ac.in/courses/117/106/117106114
3. https://nptel.ac.in/courses/108/105/108105132/
4. http://vlabs.iitkgp.ac.in/dec

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
Sl.No	**Programme Outcomes / Course Outcomes**															
The students will be able to:																
1	Demonstrate the understanding of Boolean algebra.	3	1	-	-	-	-	-	-	-	-	-	1	1	-	1
2	Describe the working of Combinational circuits.	2	1	-	-	-	-	-	-	-	-	-	1	1	-	1
3	Apply the Boolean theorems, K-Map, Q-M and VEM methods to simplify Boolean expressions.	2	-	-	-	-	-	-	-	-	-	-	1	1	-	1
4	Describe the working of Sequential circuits and its applications.	1	1	2	-	-	-	-	-	-	-	-	1	1	-	2
5	Simulate combinational circuits using HDL programming.	1	1	2	-	-	-	-	-	-	-	-	1	1	-	2

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – III

Computer Organization

Course Code:	21UCS302C	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	03	Hours	40

Course objectives:

- To understand the design and interaction concepts of modern computer subsystem
- To learn the technique for analyzing the performance of computer system.

Unit -1 (10 Hours)

Basic structure of Computers: Computer types, Functional Units, Basic operational concepts, Bus structures
Machine instructions and programs: Numbers, Arithmetic operations and characters, Memory locations and addresses, Memory operations, Instructions and instruction sequencing, Addressing modes, Assembly language, assembler directives, number notation, , Stacks and Queues, Subroutines, Encoding of machine instructions

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit II (10 Hours)

Input/output organization: Accessing I/O devices, Interrupts-Interrupt hardware, Enabling and Disabling Interrupts, Handling Multiple devices, controlling device requests, Exceptions, Direct memory access – Bus Arbitrations, Buses- Asynchronous Bus and Synchronous bus
The memory system: Some Basic concepts, Semiconductor RAM memories, read only memories, speed, size, and cost, cache memories

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit III (10 Hours)

Arithmetic Unit: Addition and subtraction of signed numbers, Design of fast adders, Multiplication of positive numbers, signed operand multiplication, Fast multiplication. Integer Division, Floating point numbers and operations – IEEE standard for Floating point numbers, Arithmetic operations on Floating point numbers. Implementing Floating point operations.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit IV (10 Hours)

Basic Processing Unit: Some fundamental concepts, Execution of complete instruction, Hardwired Control, Micro programmed control, Microinstructions,
Pipelining: basic concepts, role of cache memory, pipeline performance
Large computer systems: forms of parallel processing, array processor, the structure of general purpose and multiprocessors
Performance:
Processor Clock, Basic performance equation, pipelining and superscalar operations, Clock rate, Instruction set, compiler, performance measurement

Revised Bloom's Taxonomy Level	L_1 Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books:				
1	Computer Organization	Hamacher, Zvonko Vranesic, Safwat Zaky	Tata McGraw Hill	Fifth Edition,.2017
2	Computer Organization and Architecture'	William Stallings,	PHI	7th Edition, 2007
Web links and Video Lecture:				

- https://onlinecourses.nptel.ac.in/noc20_cs64/course
- https://www.youtube.com/watch?v=Ol8D69VKX2k
- https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO3
Sl.No	**Programme Outcomes / Course Outcomes**															
The students will be able to:																
1	Explain the design and function of different units of computer	1	--	--	--	--	--	--	--	--	--	--	1	--	--	1
2	Perform the various operations on given data	1	--	--	--	--	--	--	--	--	--	--	--	1	--	1
3	Analyse the execution of the program and different organizations of functional units	--	--	2	--	--	--	--	--	--	--	--	1	1	--	--
4	Develop an assembly programs and micro programs for simple machine instructions	--	--	2	--	--	--	--	--	--	--	--	1	1	--	1
5	Design the basic functional units of computer	--	--	3	--	---	--	--	--	--	--	--	1	--	--	3

B.E (COMPUTER SCIENCE AND ENGINEERING)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – III

Data Structures

Course Code	**21UCS303C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:2:0)	SEE Marks	50
Credits	04	Hours	52

Course Objectives:

- At the end of the course student will learn/understand/ think/experience/appreciate:
- Foundations of pointers and pointers application, dynamic memory allocation functions and recursion.
- Foundations of data structure operations, design, and implementation of data structures to organize data efficiently.
- To design and implement correct solutions for problems.
- To decide the efficient organization of data with and without use of data structure

Unit 1 (13 hours)

Pointer applications: Arrays and pointers, pointer arithmetic and arrays, passing an array to a function, Using pointers to functions.

Memory allocation functions, Array of pointers, pointers to void and pointers to functions.

Recursion: iterative and recursive definition iterative and recursive solution, designing recursive functions, limitations of recursion.

Stacks: Basic stack operations: Push, Pop, Stack top,

Stack linked list: Implementation, Data structure, Stack head, Stack data node, Stack algorithms, Create Stack, Push Stack, Stack top, Empty Stack, Full Stack, Stack count, Destroy Stack

C language implementations: Insert data, Push Stack, Print Stack, Pop character

Stack ADT: Data structure, ADT Implementations, Stack structure, create stack, Push stack, Pop stack, Stack top, Empty stack, Stack count, Destroy stack

Stack Implementation using array

Revised Bloom's Taxonomy Level	L1: Remembering, L2: Understanding, L3: Applying, L4: Analyzing

UNIT II (13 hours)	
Stack applications: **Reversing data:** Reverse a list, convert decimal to binary, Infix to postfix transformation, Evaluating postfix expressions **Queues**: **Queue Operations**: Enqueue, Dequeue, Queue front, Queue rear, Queue example, **Queue Linked list design**: Data structure, Queue head, Queue data node, Queue algorithms, Create queue, Enqueue, Dequeue, Retrieving queue data, Empty queue, Full queue, Queue count, Destroy queue **Queue ADT**: Queue structure, Queue ADT algorithms, Queue Implementation using array, **Queue Applications.**	
Revised Bloom's Taxonomy Level	L1: Remembering, L2: Understanding, L3: Applying, L4: Analyzing
UNIT III (13 hours)	
General Linear lists: **Basic operations**, Insertion, Deletion, Retrieval, Traversal, **Implementation:** Data structure, Head node, Data node, Algorithms, create list, Insert node, Delete node, List search, Retrieve node, Empty list, Full list, List count, Traverse list, Destroy list, **List ADT**: ADT functions, create list, Add node, Internal insertion function, Remove node, Internal delete function, Search list, Internal search function, Retrieve node, Empty list Full list, List count, Traverse, Destroy list, **Circular linked lists and Doubly linked lists**: Create list, add node, delete node, retrieve node, search list.	
Revised Bloom's Taxonomy Level	L1: Remembering, L2: Understanding, L3: Applying, L4: Analyzing
UNIT IV (13 hours)	
Non-Linear lists: Trees: Basic tree concepts: Terminology, User representation **Binary trees**: Properties, Height of binary trees, Balance, Complete and Nearly complete binary trees **Binary tree traversals:** Depth-first traversals, Breadth-first traversals, **Expression Trees**: Infix traversal, Postfix traversal, Prefix traversal **Huffman code, General trees,** **Binary search trees**: Basic concepts, **BST operations**: Traversals, Searches, Insertion Find the smallest and largest node, BST search, Insertion, Deletion **Binary search tree ADT**, Data structure, Head and node structure, Algorithms, Create a BST, Insert a BST, Internal insert function, Delete a BST, Internal delete function, Retrieve a BST, Internal retrieve function, Traverse a BST, Internal traverse function, Empty a BST, Full BST, BST count, Destroy a BST, Internal destroy function. **Graphs: Basic concepts**, **Operations**: Insert vertex, delete vertex, Add edge, Delete edge, Find vertex, **Graph storage structures**: Adjacency matrix, Adjacency list.	
Revised Bloom's Taxonomy Level	L1: Remembering, L2: Understanding, L3: Applying, L4: Analyzing
Course outcomes: At the end of the course, the students will be able to • Demonstrate the understanding of pointers, dynamic memory allocation, recursion and data structures.	

- Explain implementation of data structures with and without ADT
- Identify the data structures needed to solve given problem.
- Design and develop solutions for simple problems using the data structures
- Compare and contrast different data structures

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books				
1	Computer Science A Structured Programming Approach Using C, (Chapter 6:6.9 Chapter 7,Chapter 9,10, Chapter 11:11.3,11.4,11.5, Chapter 12,Chapter 13, Chapter 14,Appendix G:G.1,G.2,G.3, Appendix H,I,Appendix J)	Behrouz A,Forouzan& Richard F Gilberg,	Cengage Learning India Private Limited	Third Edition,
2	**Data Structure A Pseudocode Approach with C**, (Chapter 1(1.2,1.3,1.5), 2,3,4 (4.1-4.4), 5, 6(6.1-6.3)7(7.1-7.3), 11(11.1-11.3),12(12.2-12.4)13(13.1-13.3) Appendix F.	Behrouz A. Forouzan and Richard F. Gilberg,	Cengage Learning Publisher,	2nd Edition, 2005.
3	Data Structures Using C,	Aaron M. Tenanbaum ,YedidyahLangsam, Moshe J Augenstein	Pearson	
4	Data Structures Through C	YeshwantKanetkar	BPB	

Web links and Video Lectures:

- NPTEL Course : https://nptel.ac.in/courses/106102064,
- NPTEL Course : https://nptel.ac.in/courses/106106127
- https://www.coursera.org/learn/data-structures

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

	Subject/*Subject Code:*	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
No	Programme Outcomes / Course Outcomes															
The students will be able to:																
1	**Demonstrate the understanding of pointers, dynamic memory allocation, recursion and data structures**		**2**	**2**	**2**	**2**								**3**		**2**
2	**Explain implementation of data structures with and without ADT**		**2**	**2**	**2**	**2**								**2**		**2**
3	**Identify the data structures needed to solve given problem**		**3**	**3**	**3**	**3**								**3**		**3**
4	**Design and develop solutions for simple problems using the data structures**		**3**	**3**	**3**	**3**							3	**3**		**3**
5	**Compare and contrast different data structures**		**3**	**3**	**3**	**3**								**3**		**3**

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – III

Digital Systems Lab

Course Code:	**21UCS304L**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	50
Credits	01	Exam Hours	03

Course objectives:

- Make use of simplifying techniques in the design of combinational circuits.
- Illustrate combinational and sequential digital circuits.
- Demonstrate the use of flip flops.
- Design and test registers and counters.

Practice Assignments using digital I C's:

- Implementation of Boolean Expressions of basic logic gates such as 2-input/3-input AND, OR,NAND,NOR, EX-OR Gates.
- Simplification of simple Boolean Expressions in SOP/POS forms.

PART- A (Hardware Implementation)

1. Design a Binary to Gray Code converter with K map simplification and ExOR Gate.
2. Given any 4-variable logic expression, simplify using K-MAP/Quine McCliskey and realize the simplified logic expression using 8:1 multiplexer IC.
3. Realize a full adder using 3-to-8 decoder IC and 4 input NAND gates.
4. Realize a full substractor circuit using 3-to-8-line decoder IC and 4 input NAND gate.
5. Realize a J-K Master/Slave Flip-Flop using NAND gates and verify its truth table.
6. Design and implement a mod-n (n<8) synchronous Up Counter using J-K Flip-Flop and basic gate ICs.
7. Design and implement a mod-n (n<8) synchronous Down Counter using J-K Flip-Flop and basic gate ICs.
8. Design and implement an asynchronous counter using decade counter IC to count up from 0 to (n<=9) & display the numbers using 7-segment display.
9. Design a Ring and Johnson Counter using a 4-bit Shift Register IC.

Practice Assignments using Simulation package:

- Implementation of Boolean Expressions of basic logic gates such as 2-input/3-input AND, OR,NAND,NOR, EX-OR gates
- Simplification of simple Boolean Expressions in SOP/POS forms

PART- B (Software Implementation)

1. Write the Verilog/VHDL code for Binary to Gray Code converter and verify it's working.
2. Write the Verilog/VHDL code for an 8:1 multiplexer. Simulate and verify it's working.
3. Write the Verilog/VHDL code for a full adder. Simulate and verify its working.
4. Write the Verilog/VHDL code for D Flip-Flop with positive-edge triggering. Simulate and verify its working.
5. Write a Verilog/VHDL code for mod-8 up counter. Simulate and verify it's working.
6. Write the Verilog/VHDL code for switched tail counter. Simulate and verify its working

Revised Bloom's Taxonomy Level L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysis

Note:

- Any simulation package like MultiSim/Active HDL etc. may be used.
- In the examination questions must be given on lots. Each student must be given one question from PART-A and one from PART-B.
- Practice Assignments are not to be considered for SEE Examination.

Course Outcomes:

At the end of the course the student should be able to:

- Design and implement combinational circuits.
- Design and Implement sequential Circuits
- Simulate sequential and combinational circuits using VHDL/Verilog Programming

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
Sl.No	Programme Outcomes / Course Outcomes															
The students will be able to:																
1	Design and implement combinational circuits.	3	1	-	-	-	-	-	-	-	-	-	1	1	-	1
2	Design and Implement sequential Circuits.	2	1	-	-	-	-	-	-	-	-	-	1	1	-	1
3	Simulate sequential and combinational circuits using VHDL	2	1	2	-	-	-	-	-	-	-	-	1	1	-	1

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – III

Data Structures Lab

Course Code:	**21UCS305L**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	50
Credits	01	Exam Hours	03

Course objectives:

At the end of the course student will learn/understand/ think/experience/appreciate:

- To design and implement correct solutions for given problems.
- To decide the efficient organization of data with and without use of data structure.
- To use appropriate data structures for representing, organizing and manipulating data for different kinds of problems.

Assignment List:

1. Write C program to perform the following using function pointer concept.
   i. **complex_sum( )** takes addresses of the two complex numbers as parameters as void* and returns the result as void *
   ii. **int_sum( )** takes two integer operand as void* as parameters and returns the result as void*.
   iii. **float_sum( )** takes two integer operand as void* as parameters and returns the result as void*.
   iv. **sum_two_nos( )** that takes addresses of two operands and address of the function that is to be invoked on these two operands
   v. **getfun( )** that accepts from the user appropriate function based on users choice.
   vi. **main( )** method that invokes these function based on users choice.
2. Write Recursive function for the followings:
   a. To find sum of first N natural numbers.
   b. To print first N Fibonacci series.
   c. To convert given decimal number to binary.
   d. Write main ( ) to call above functions.
3. Develop linked stack ADT and create stack of integer using the ADT's defined.
4. Develop array stack ADT and create stack of students using the ADT's defined.
5. Develop linked Queue ADT and create Queue of floats using the ADT's defined.
6. Develop array Queue ADT and create Queue of strings using the ADT's defined.
7. Create Linked list ADT and use the same to create list of student's information.
8. Create binary tree and allow following operations on tree
   i. Search an element ii. Insert an element iii. Tree is balanced or not iv. No of occurrences of key element v. No of nodes, no of leaf nodes, no of intermediate node vi. Find parent of key node vii. Traverse in preorder, post order, in order, breadth first order viii. To copy tree
9. Create binary search tree of integers and allow following operations on tree:
   i. Insert an element ii. Delete an element iii. Search an element iv. Tree is balanced or not v. No of occurrences of key element vi. No of nodes, no of leaf nodes, no of intermediate node vii. Find parent of key node viii. Traverse in preorder, post order, in order, breadth first order ix. To copy tree x. To print elements in descending order

Revised Bloom's Taxonomy Level L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysis

Course Outcomes:

At the end of the course the student should be able to:

- Write C programs to use data structures to represent, organize and manipulate data for given problem.
- Design and implement solutions for organization of data using different data structures.
- Choose appropriate data structures for representing, organizing and manipulating data for different kinds of problems

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

No	Programme Outcomes / Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
The students will be able to:																
1	Write C programs to use data structures to represent, organize and manipulate data for given problem		3	3	3	3								3		3
2	Design and implement solutions for organization of data using different data structures		3	3	3	3							3	3		3
3	Choose appropriate data structures for representing, organizing and manipulating data for different kinds of problems		3	3	3	3							2	3		3

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – III

Professional Communication

Course Code:	**21UCS306C**	CIE Marks	100
Teaching Hours/Week (L:T:P)	(0:2:0)	SEE Marks	-
Credits	01	Hours	16

Course objectives:

- Develop communication skills relevant to engineering as a profession
- Make effective presentations
- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace.

Tutorials

1. **Communication skills (Verbal and Non Verbal):** Self-Introduction organizing the material - Introducing the topic – answering questions.
2. **Listening skills:** Exercises based on Listening (audio, speech, lectures, songs, listen and draw/speak etc)
3. **Conversations and Dialogues-** Exercises based on situations, scenarios, skits, telephonic.
4. **Public Speaking-** Exercises based on different topics.
5. **Presentation skills-** individual presentation practice— presenting the visuals effectively, qualities of a good presentation with emphasis on body language and use of visual aids.
6. **Group Discussions-** Participating in group discussions – understanding group dynamics - brainstorming the topic -– questioning and clarifying –GD strategies- activities to improve GD skills, instruction activities.
7. **Interview skills-** Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews.
8. **Writing skills(resume,letter)-** Letter writing, CV writing, Attending a meeting and Minute Preparation, Vocabulary Building.
9. **Reading Skills:** Speed Reading, Reading with the help of Audio Visual Aids, Reading Comprehension Skills.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysis

Activities

1. **Communication skills (Verbal and Non-Verbal)**
   a) Speaking on the topic given.
2. **Listening skills:**
   a) Given a topic, a student should speak about it and the others should summarize the information using proper listening skills.
   b) Given instructions from the teacher, students should apply it and exhibit it.
3. **Conversations and Dialogues**
   a) Given a situation the students should carry out proper conversation.
   b) Carrying out telephonic conversations with different categories of persons.
4. **Public Speaking**
   a) Topics to be given to the student for giving awareness to the public.
5. **Presentation skills-**
   a) Presentation on technical topic using proper visual aids.
6. **Group Discussions**
   a) Participating in group discussions to solve any given situation.
   b) Carrying out debate.

7. **Interview skills.**
    a) Carrying out mock face-to-face interview.
8. **Writing skills(resume, letter)**
    a) Resume writing.
    b) Formal letter writing (leave application, job application etc).
9. **Reading Skills:**
    a) Reading Comprehension and answering the questions.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying , L4-Analysis

Course Outcomes

At the end of the course the student should be able to

- Analyze the variety of communication and listening skills.
- Discuss a given technical/non-technical topic effectively in groups.
- Create effective technical presentations.
- Write an impressive resume, technical letters and face the interview confidently.
- Reading clearly and precisely presenting the document.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books				
1	Technical Communication Principles and practices	Meenakshi Raman and Sangeet Sharma	Oxford University Press	2004
2	Business Communication	Meenakshi Raman and Prakas Singh	Oxford University Press, ISBN13: 9780195676952	2006
3	Business Communication	Urmila Rainad S,M Rai	Himalaya Publishing House	2011
4	Effective Technica Communication	M. Ashraf Rizivi	McGraw Hill	2nd Edition, 2017
5	Professional Communication	Aruna Koneru	Tata McGraw-Hill Education, 2008	2008

Question paper pattern:

Scheme of Evaluation:

1. CIE I - Activity 1- 25 marks

   Activity 2 – 25 marks

2. CIE II - Activity 1- 25 marks

   Activity 2 – 25 marks

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

	Subject/*Subject Code:*	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
No	Programme Outcomes / Course Outcomes															
The students will be able to:																
1	Analyze the variety of communication and listening skills.		3		2			2	1	2	3		3	3		
2	Discuss a given technical/non-technical topic effectively in groups.		3		2				1	3			3	3		
3	Create effective technical presentations.	3							1	2	3		3	3		
4	Write an impressive resume, technical letters and face the interview confidently.	3						2	1	2	3		3			
5	Reading clearly and precisely presenting the document.								1	2	3		3			

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – III

Universal Human Values-II

Course Code:	**21UHS324C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	**(1:0:0)**	SEE Marks	50
Credits	01	Hours	**15**

Course objectives:

This course will enable students to

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

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

Unit -1 (4 Hours)

Introduction to Value Education: Right Understanding; Relationship and Physical Facility; Understanding Value Education; Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity -the Basic Human Aspiration-Current Scenario and Method to Fulfill the Basic Human Aspirations.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying , L4-Analysing

Unit II (4 Hours)

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

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying , L4-Analysing

Unit III (4 Hours)

Harmony in the Family and Society and Nature: Harmony in the Family – the Basic Unit of Human Interaction; 'Trust' – the Foundational Value in Relationship; 'Respect' – as the Right Evaluation: Other Feelings, Justice in Human-to-Human Relationship; Understanding Harmony in the Society; Vision for the Universal Human Order; Understanding Harmony in the Nature; Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying , L4-Analysing

Unit IV (3 Hours)

Implications of the Holistic Understanding – a Look at Professional Ethics

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; Strategies for Transition towards Value-based Life and Profession

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Course outcomes:

At the end of the course the student will be able to:

- Explore holistic vision of life - themselves and their surroundings.
- Develop competence and capabilities for maintaining Health and Hygiene.
- Analyze various problems in life, family, Society and in handling problems with Sustainable Solutions.
- Apply values to their own self in different day-to-day settings in real life and in handling problems with sustainable solutions.
- Adopt the value of appreciation and aspiration for excellence and gratitude for all.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books				
1	A Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria,	Excel Books, New Delhi, ISBN 978-93-87034-47-1	2nd Revised Edition, 2019
2	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics	, R R Gaur, R Asthana,G P Bagaria,	Excel Books, New Delhi, ISBN 978-93-87034- 53-2	2nd Revised Edition, 2019
3	JeevanVidya :EkParichaya	A Nagaraj,	JeevanVidyaPrakashan, Amarkantak	1999.
4	Human Values	A.N. Tripathi,	New Age Intl. Publishers, New Delhi	1999.
5	The Story of Stuff(book)			
7	The Story of My Experiments with Truth	Mohandas Karamchand Gandhi		
8	Small is Beautiful	E. F Schumacher		
9	Slow is Beautiful	Cecile Andrews		
10	Economy of Permanence	J C Kumarappa		
11	Bharat Mein Angreji Raj	Pandit Sunderlal		
12	Rediscovering India	Dharampal		
13	Hind Swaraj or Indian Home Rule	Mohandas Karamchand Gandhi		
14	India Wins Freedom	Maulana Abdul Kalam Azad		
15	Vivekananda	Romain Rolland		
16	Gandhi	Romain Rolland		

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Sl. No	**Programme Outcomes / Course Outcomes**															
The students will be able to:																
1	Explore holistic vision of life - themselves and their surroundings							3	2	3			1			
2	Develop competence and capabilities for maintaining Health and Hygiene.						3	3	1	1			1			
3	Analyze various problems in life, family, Society and in handling problems with Sustainable Solutions.						3	3	2	1			1			
4	Apply values to their own self in different day-to-day settings in real life and in handling problems with sustainable solutions.						2	2	3	2			1			
5	Adopt the value of appreciation and aspiration for excellence and gratitude for all.								3				1			

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – III

Constitution Of India

Course Code:	**21UHS321C/21UHS421C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	**(1:0:0)**	SEE Marks	50
Credits	01	Hours	**15**

Course objectives:

This course will enable students to

- To realize the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
- To identify the importance of fundamental rights as well as fundamental duties.
- To understand the functioning of Union, State and Local Governments in Indian federal system.
- To review procedure and effects of emergency, composition and activities of election commission.

Unit -1 (4 Hours)

Introduction Indian constitution: The Salient Features of the Indian Constitution. Preamble to the Constitution of India. Fundamental Rights, Directive Principles of State policy and Fundamental Duties**.**

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit II (4 Hours)

The Union and State Governments: The Union Executive, The Union Legislature and The Union Judiciary - The Supreme Court of India.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit III (4 Hours)

The Indian State Government: The State Executive, The State legislature and The State Judiciary **the Local Government:** Local Government-Panchayat raj system with special reference to 73rd and Urban Local Self Govt. with special reference to74th Amendment

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit IV (3 Hours)

Election provisions, Emergency provisions, Amendment of the constitution:

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Course outcomes:

At the end of the course the student will be able to:

- Understand and explain the significance of Indian Constitution as the fundamental law of the land.
- Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.
- Analyze the Indian political system, the powers and functions of the Union, State and Local Governments in detail.
- Elaborate Electoral Process, Emergency provisions and Amendment procedure.
- Understand and explain the significance of Indian Constitution as the fundamental law of the land.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books				
1	An introduction to the constitution of India and Profession Ethics	Venkatesh B. R. and Merunandan K. B	Idea International Publication, Bangalore	
2	Introduction to the Constitution of India	M. V. Pylee	Vikas publication	4th Edition, 2005
3	The Constitution of India and Profession of Ethics	K. R. Phaneesh	Sudha Publication, Bangalore	
4	Introduction to the constitution of India	Durga Das Basu	Prentice-Hall EEE	(Student Edition), 19thedition,2008.
5	Engineering Ethics	Charles Harries J. R. and Michard and Michael J. Rabins		

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
Sl. No	**Programme Outcomes / Course Outcomes**															
The students will be able to:																
1	Understand and explain the significance of Indian Constitution as the fundamental law of the land.	-	-	-	-	-	1	1	-	-	-	-	1			
2	Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.	-	-	-	-	-	3	1	-	-	-	-	2			
3	Analyze the Indian political system, the powers and functions of the Union, State and Local Governments in detail.	-	-	-	-	-	1	1	-	-	-	-	1			
4	Elaborate Electoral Process, Emergency provisions and Amendment procedure.	-	-	-	-	-	-	-	-	-	-	-	1			
5	Understand and explain the significance of Indian Constitution as the fundamental law of the land.	-	-	-	-	-	1	1	-	-	-	-	1			

IV Semester
Scheme and Syllabus

Sl.No	Category	Subject Code	Subject Title	Credits	HOURS/ WEEK			EXAMINATION MARKS		
					L	T	P	CIE	SEE	total
1.	BSC	21UMA491C	Statistics and Probability Distribution	3	3	0	0	50	50	100
2.	PCC	21UCS401C	Database Management System	3	2	2	0	50	50	100
3.	PCC	21UCS402C	Operating Systems	3	2	2	0	50	50	100
4.	PCC	21UCS403C	Object Oriented Programming with Java	3	3	0	0	50	50	100
5.	PCC	21UCS404C	Finite Automata and Formal Languages	3	3	0	0	50	50	100
6.	PCC	21UCS405L	Database Management System Lab	1	0	0	2	50	50	100
7.	PCC	21UCS406L	Object Oriented Programming with Java Lab	1	0	0	2	50	50	100
8.	PCC	21UCS407L	Operating Systems Lab	1	0	0	2	50	50	100
9.	HSMC	21UHS422C 21UHS423C	Samskrutika Kannada Balake Kannada	1	1	0	0	50	50	100
10	INT	21UCS408I	Summer Internship – I	2	-	-	-	100	0	100
		21UMA400M	Bridge Course Mathematics-II *	00*	3*	0	0	50*	50*	100*
* Only for Lateral Entry students			**Total**	**21**	**14**	**4**	**6**	**550**	**450**	**1000**

B.E (COMPUTER SCIENCE AND ENGINEERING)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER – IV

Statistics and Probability Distribution

Course Code:	**21UMA401C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	03	Hours	40

Course objectives:

- To apply the knowledge of Statistics in various Engineering fields
- To be acquired knowledge about predictions preferably on the basis of mathematical equations
- To be understand the principal concepts about probability

Unit -1 (10 hours)

Statistics:

Curve fitting by the method of least squares: $y = a + bx$, $y = ab^x$, $y = a + bx + cx^2$. Correlation, expression for the rank correlation coefficient and regression.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying , L4-Analysing

Unit II (10 Hours)

Probability: addition rule, conditional probability, multiplication rule, Bayes' rule. Discrete and continuous random variables-Probability density function, Cumulative distribution function, Problems on expectation and variance.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit III (10 Hours)

Probability distributions:

Binomial distributions, Poisson distributions and Normal distributions. Concept of joint probability, Joint probability distributions.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit IV (10 Hours)

Markov chains: \

Introduction, Probability vectors, Stochastic Matrices, Fixed Points and Regular stochastic Matrices, Markov chains, higher transition probabilities, stationary distribution of regular Markov chains and absorbing states.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Course outcomes:

At the end of the course the student will be able to:

- Apply the least square sense method to construct the specific relation for the given group of data.
- Solve problems on correlation and regression
- Apply the concepts of probability
- Apply the concepts of probability distributions
- Apply the concept of Markov Chain for commercial and industry purpose.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books:				
1	Numerical Methods for Engineers	Steven C Chapra & Raymond P Canale		
2	Higher Engineering Mathematics	Dr. B.S. Grewal	Khanna Publishers, New Delhi	
3	Advanced Engineering Mathematics	H. K. Das	S. Chand & company Ltd. Ram Nagar, New Delhi	
4	Advanced Engineering Mathematics	E Kreyszig	John Wiley & Sons	
5	Probability and stochastic processes	Roy D. Yates and David J. Goodman	Wiley India pvt.ltd	2nd edition 2012
6	Theory and problems of probability	Seymour Lipschutz	Schaum's Series)	

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

	Subject/*Subject Code:*	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
No	**Programme Outcomes** / **Course Outcomes**												
1	Apply the least square sense method to construct the specific relation for the given group of data	1	2	--	--	--	--	--	--	--	--	--	--
2	Solve problems on correlation and regression	1	2	--	--	--	--	--	--	--	--	--	--
3	Apply the concepts of probability	1	--	--	--	--	--	--	--	--	--	--	--
4	Apply the concepts of probability distributions	1	--	---	--	--	--	--	--	--	--	--	--
5	Apply the concept of Markov Chain for commercial and industry purpose	1	--	--	--	---	--	--	--	--	--	--	--

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – IV

Bridge Course Mathematics-II (Mandatory)

Course Code:	**21UMA400M**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	50
Credits	--	Hours	40

Course objectives:

This course will enable students to

- Enhance learning of Engineering Mathematics.
- Study basic concepts of differential equations and Laplace transforms

Unit -1 (10 hours)

Differential Equations-1:

Ordinary differential equations of first order**:** Variable separable, Homogeneous. Exact form and reducible to exact differential equations. Linear and Bernoulli's equation.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit II (10 Hours)

Differential Equations-2:

Second and higher order linear ODEs with constant coefficients-Inverse differential operator, method of variation of parameters (second order); Cauchy's and Legendre homogeneous equations.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit III (10 Hours)

Laplace Transform:

Introduction, Definition of Laplace Transform, Laplace Transform of standard functions, Properties: Shifting, differentiation, Integral and division by t. Periodic function, Heaviside's Unit step function.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit IV (10 Hours)

Inverse Laplace transforms:

Properties, Convolution theorem-problems, Solutions of linear differential equations

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Course outcomes:

At the end of the course the student will be able to:

- Solve first order first degree differential equations.
- Solve second and higher order linear differential equations.
- Apply Laplace transforms for standard functions and its properties
- Apply Inverse Laplace transforms for standard functions
- Solve differential equations using Laplace transform method.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books:				
1	Higher Engineering Mathematics	Dr. B.S. Grewal	Khanna Publishers, New Delhi	2017
2	Advanced Engineering Mathematics	E Kreyszig	John Wiley & Sons , Pvt.Ltd	2014
3	Elementary Differential Equations by	Earl D. Rainville and Phillip E, Bedient		Sixth Edition
4	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons	2014

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Sl.No	**Programme Outcomes / Course Outcomes**															
The students will be able to:																
1	Solve first order first degree differential equations.	1	2													
2	Solve second and higher order linear differential equations.	1	2													
3	Apply Laplace transforms for standard functions and its properties	1	2													
4	Apply Inverse Laplace transforms for standard functions	1	2													
5	Solve differential equations using Laplace transform method	1	2													

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – IV

Database Management Systems

Course Code:	**21UCS401C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	**(2:2:0)**	SEE Marks	50
Credits	03	Hours	40

Course objectives:

This course will enable students to

- Provide for mass storage of relevant data and making easy access to data for the authorized user.
- Eliminate Duplicate data and allow multiple users to be active at one time.
- Provide data integrity and protect the data from physical harm and unauthorized access.
- Serving different types of users and combining interrelated data to generate a report
- Provide multiple views for same data.

Unit -1 (7 Hours Teaching+3 Hours tutorial)

Introduction and Entity-Relationship Model

Introduction; Characteristics of Database approach; People with databases; Advantages; Disadvantages of DBMS. Data models, schemas, and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design for COMPANY database; ER Diagrams, Naming Conventions

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit II (7 Hours Teaching+3 Hour's tutorial)

Relational Model and Relational Algebra

Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design using ER- to-Relational Mapping.

SQL-The Relational Database Standard:

SQL Data Definition and Data Types, Specifying Basic Constraints in SQL, Schema Change Statements in SQL; Basic Queries in SQL

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit III (7 Hours Teaching+3 Hour's tutorial)

Database Design

Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form; Exercises. Properties of relational decomposition, algorithm for relational database schema design.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying , L4-Analysing

Unit IV (7 Hours Teaching+3Hours tutorial)

Transaction Management and Recovery Techniques

Introduction to transaction processing; Transaction and System concepts; The ACID Properties; Characterizing Schedules Based on Recoverability; Two-Phase Locking Technique for concurrency Control(2PL); Recovery Concepts; Recovery and backup Techniques Based on Deferred Update and Immediate Update

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Course outcomes:

At the end of the course the student will be able to:

- Explain the concepts of database and database management system.
- Model Entity-Relationship diagrams for enterprise level databases.
- Formulate Queries using SQL and Relational Formal Query Languages.
- Apply normalization concepts to refine designed database.
- Summarize concurrency control protocols and recovery algorithms**.**

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books				
1	Fundamentals of Database Systems	Elmasri and Navathe	Addison-Wesley	7th Edition, 2018
2	Silberschatz, Korth and Sudharshan	Database System Concepts	Mc-GrawHill	5th Edition, 2006
3	Raghurama Krishnan, Johannes Gehrke	Database Management Systems	TATA McrawHill	3rd Edition, 2014

Web links and Video Lectures:

- https://www.javatpoint.com/dbms-tutorial
- https://youtu.be/MtOFF91igB0
- https://archive.nptel.ac.in/courses/106/105/106105175/

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Sl.No	**Programme Outcomes / Course Outcomes**															
The students will be able to:																
1	Explain the concepts of database and database management system.	3											2			
2	Model Entity-Relationship diagrams for enterprise level databases		3	3		2							2	3		2
3	Formulate Queries using SQL and Relational Formal Query Languages	2	3	3	2	3							2	3		3
4	Apply normalization concepts to refine designed database	2	3	3						3		3	2	3		3
5	Summarize concurrency control protocols and recovery algorithms.		2										2			1

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – IV

Operating Systems

Course Code:	**21UCS402C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	**(2:2:0)**	SEE Marks	50
Credits	03	Hours	40

Course objectives:

- This course will enable students to
- To explain main components of OS and their working
- To familiarize the operations performed by OS as a resource Manager
- To impart various scheduling policies of OS
- To teach the different memory management and synchronization techniques.

Unit -1 (08 Hours Lectures + 04 Hours Tutorials)

Introduction: What Operating Systems Do, Computer-System Organization, Computer-System Architecture. Operating-System Operations, Resource Management, Security and Protection Virtualization, Distributed Systems, Computing Environments.

PROCESS: Processes Process Concept, Process Scheduling, operations on Processes, Interposes Communication, IPC in Shared-Memory Systems, IPC in Message-passing Systems.

Threads & Concurrency: overview, Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multi-Processor Scheduling, Real-Time CPU Scheduling, Operating-System Examples, Algorithm Evaluation

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit II (08 Hours Lectures: 04 Hours Tutorials)

Synchronization Tools: Background, The Critical-Section Problem, Peterson's Solution, Hardware Support for Synchronization, Mutex Locks, Semaphores, Monitors, Liveness, Evaluation, Classic problems of synchronization.

Deadlocks: System Model, Deadlock in Multithreaded Applications, Deadlock Characterization, Methods for Handling Deadlocks, Methods for Handling Deadlocks, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit III (08 Hours Lectures: 04 Hours Tutorials)

Main Memory: Background, Contiguous Memory Allocation, Paging Structure of the Page Table, Swapping, Example: Intel 32- and 64-bit Architectures,

Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit IV (08 Hours Lectures: 04 Hours Tutorials)

File-System Interface: File Concept, Access Methods, Directory Structure, Protection, Memory-Mapped Files
File-System Implementation: File-System Structure, File-System Operations, Directory Implementation,

Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery, Example: The WAFL File System

File-System Internals: File Systems, File-System Mounting, Partitions and Mounting, File Sharing, Virtual File Systems Remote File Systems , Consistency Semantics

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Course outcomes:

At the end of the course the student will be able to:

- List and explain goals, service, and functions of different classes of operating systems.
- Analyse the performances of different process scheduling, memory management, file system implementation, protection, and security mechanisms.
- Apply scheduling and memory allocation policies for solving scheduling and memory management problems.
- Develop simple concurrent applications using processes and threads
- Explain mechanisms for deadlock handling, synchronization and inter process communication.

Sl No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Reference Books				
1	Operating System Concepts	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	John Wiley & Sons, Inc. ISBN 978-1-118-06333-0	Tenth Edition, 2018
2	Operating Systems--A Concept Based Approach	D. M. Dhamdhere	McGraw-Hill	3rd Edition,2013
3	Modern Operating Systems	Andrew S. Tanenbaum and Herbert Bos	Pearson	4th edition, 2014
4	An Introduction to Operating Systems	P.C.P. Bhatt	PHI(EEE),	4th Edition2014.
5	Operating Systems: Internals and Design Principles	William Staling	Pearsons	9th Edition,2019

Web links and Video Lectures:

- https://onlinecourses.nptel.ac.in/noc21_cs44/
- https://onlinecourses.nptel.ac.in/noc22_cs78/
  https://www.coursera.org/specializations/codio-introduction-operating-systems
  https://www.scs.stanford.edu/21wi-cs140/

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
Sl.No	Programme Outcomes / Course Outcomes															
The students will be able to:																
1	List and explain goals, service and functions of different classes of operating systems	1	1	1									1	1		
2	Analyse the performances of different process scheduling, memory management, file system implementation, protection and security mechanisms		3	2									1	1		
3	Apply scheduling and memory allocation policies for solving scheduling and memory management problems.	1		3									1	1		1
4	Develop simple concurrent applications using processes and threads	2	1	3									1	1		3
5	Explain mechanisms for deadlock handling, synchronization and inter-process communication.	1	2	2									1			2

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – IV

Object Oriented Programming With Java

Course Code:	**21UCS403C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	**(3:0:0)**	SEE Marks	50
Credits	03	Hours	40

Course objectives:

This course will enable students to

- Improve the analytical skills through object-oriented programming.
- Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc. and exception handling mechanisms.
- Gain knowledge about Java language syntax and semantics to write Java programs.
- Have an insight of the principles of inheritance, packages and interfaces and other features of java.

Unit -1 (10 Hours)

Java Programming Fundamentals: Object Oriented programming features
History and evolution of Java: Java's lineage, bytecode, Java Buzzwords**.**
An overview of Java, Data **Types, Variables and Arrays** , **Operators , Control Statements**
Introducing Classes: Class Fundamentals, Declaring Objects, Introducing Methods , Constructors ,this keyword ,garbage collection, method overloading.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit II (10 Hours)

Inheritance, Packages and Interfaces
String Handling, Type wrappers
Exception Handling: Exception-Handling Fundamentals – Exception Classes , Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch clauses, Nested try Statements, throw and finally statements.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit III (10 Hours)

Lambda Expressions: Fundamentals, Block Lambda expressions, Passing Lambda Expressions as argument, Lambda Expressions and Exceptions.
Multithreaded Programming: The Java Thread Model, The Main Thread , Creating a Thread, Creating Multiple Threads, Using isAlive( ) and join() , Thread Priorities , Synchronization , Suspending, Resuming and Stopping Threads

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit IV (10 Hours)

JAVA 2 ENTERPRISE EDITION OVERVIEW, DATABASE ACCESS: Overview of J2EE and J2SE. The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement; ResultSet Objects

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Course outcomes:

At the end of the course the student will be able to:

- Acquire knowledge of underlying concepts of object-oriented programming.
- Design Classes and establish relationship among Classes for various applications from problem definition
- Demonstrate the creation & use of Packages & Interfaces and incorporate thread concepts to develop multithreaded programs in Java.
- Use Exception handling, polymorphism, and inheritance to develop Java programs.
- Design and develop simple applications using Java and JDBC.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books				
1	Java The Complete Reference	Herbert Schildt	MGH Education	9th Edition, 2014
2	J2EE - The Complete Reference	Jim Keogh	Tata McGraw Hill	2007
3	Core Java Volume 1-Fundamentals	Cay S Horstmann ,Gary Cornell	Pearson Education	8th Edition, 2007
4	Programming with Java	E Balagurusamy	MGH Education	6th Edition, 2019

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
Sl.No	**Programme Outcomes / Course Outcomes**															
The students will be able to:																
1	Acquire knowledge of underlying concepts of object-oriented programming.		1										3			
2	Design Classes and establish relationship among Classes for various applications from problem definition		3	2	1								3	2		2
3	Demonstrate the creation & use of Packages & Interfaces and incorporate thread concepts to develop multithreaded programs in Java.	2	3	3		3							3	2		2
4	Use Exception handling, polymorphism, and inheritance to develop Java programs.	2	3	3		3							3	2		2
5	Design and develop simple applications using Java and JDBC.	2	3	3		3							3	3	1	3

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – IV

Finite Automata And Formal Languages

Course Code:	**21UCS404C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	**(3:0:0)**	SEE Marks	50
Credits	03	Hours	40

Course objectives:

This course will enable students to

- To have an insight into the basic principles of computation including automata, grammars and Turing machines.
- To develop the proficiency in theoretical foundations of Computer Science.

Unit -1 (10 Hours)

Introduction to the Theory of Computation: Three Basic Concepts Languages Grammars Automata, Some Applications.

Deterministic Finite Accepters: Deterministic Accepters and Transition Graphs, Languages and Dfa's, Regular Languages.

Nondeterministic Finite Accepters: Definition of a Nondeterministic Accepter

Equivalence of Deterministic and Nondeterministic Finite Accepters, Reduction of the Number of States in Finite Automata.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit II (10 Hours)

Regular Languages and Regular Grammars: Regular expressions; Formal Definition of a Regular Expression, Languages Associated with Regular Expressions.

Connection between Regular Expression and Regular Languages: Regular Expressions Denote Regular Languages, Regular Expressions for Regular Languages.

Regular Grammars: Right- and Left-Linear Grammars, Right-Linear Grammars for Regular Languages

Properties of Regular Languages: Closure under Simple Set Operations, Closure under Other Operations; Identifying Nonregular Languages: A Pumping Lemma.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit III (10 Hours)

Context-Free Languages: Context-Free Grammars; Examples of Context-Free Languages, Leftmost and Rightmost Derivations, Derivation Trees.

Parsing and Ambiguity: Ambiguity in Grammars and Languages

Simplification of Context-Free Grammars and Normal Forms: A Useful Substitution Rule, Removing Useless Productions, removing λ-Productions, Removing Unit-Productions.

Two Important Normal Forms: Chomsky Normal Form, Greibach Normal Form.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Unit IV (10 Hours)

Pushdown Automata: Nondeterministic Pushdown Automata: Definition of a Pushdown Automaton, The Language Accepted by a Pushdown Automaton.

Pushdown Automata and Context-Free Languages: Pushdown Automata for Context-Free Languages, Context-Free Grammars for Pushdown Automata.

Turing Machines: Definition of a Turing Machine, Turing Machines as Language Accepters, Turing Machines as Transducers.

Turing Machine with More Complex Storage: Multitape and Multidimensional Turing Machines.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Course outcomes:

At the end of the course the student will be able to:

- Demonstrate a fundamental knowledge of the core concepts in automata theory and formal languages.
- Prove the properties of languages, grammars and automata with formal mathematical methods;
- Analyse the closure properties of regular and context-free languages.
- Design finite automata, pushdown automata, Turing machines for solving language pattern recognition problems.
- Apply mathematical and formal techniques for solving problems in Computer Science.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books				
1	Introduction to Formal Languages and Automata	Peter Linz	Jones and Bartlett Student Edition	6th Edition, 2015
2	Introduction to Automata Theory, Languages, and Computation,	Hopcroft, Motwani, and Ullman	Pearson Education India	3rd Edition, 2014
3	Introduction to the Theory of Computation	Michael Sipser	Cengage Learning	3rd Edition, 2012
4	Automata, Computability and Complexity: Theory and Applications	E Rich	Pearson Education India	1st Edition, 2012
5	Introduction to languages and the theory of computation.	Martin, John C	McGraw-Hill	4th Edition, 2013
6	Theory of Computer Science	K L P Mishra, N Chandrasekaran	PHI Learning Pvt. Ltd.	3rd Edition, 2012

Web links and Video Lectures:

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU EDUSAT PROGRAMME – 20

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Sl.No	~~Programme Outcomes~~ Course Outcomes															
The students will be able to:																
1	Demonstrate a fundamental knowledge of the core concepts in automata theory and formal languages.	2	3	3	3									3		
2	Prove the properties of languages, grammars and automata with formal mathematical methods.	3	2	2	3											
3	Analyze the closure properties of regular and context-free languages.	1	3	3	2	1								3		
4	Design finite automata, pushdown automata, Turing machines for solving language pattern recognition problems.	3	2	3	2	2										
5	Apply mathematical and formal techniques for solving problems in Computer Science.	1	2	1	3	3										

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – IV

Database Management System Lab			
Course Code:	21UCS405L	CIE Marks	50
Teaching Hours/Week (L:T:P)	**(0:0:2)**	SEE Marks	50
Credits	01	Exam Hours	03

Course objectives:

This course will enable students to

- Design database Schema for a given application and apply normalization
- Acquire skills in using SQL commands for data definition and manipulation
- Develop solutions for database applications using procedures, cursors and triggers

Assignment List

Design the Database for any one of the following applications and implement the SQL Queries on designed database.

a) Banking System,
b) Employee Organization
c) Inventory Processing System
d) Library Management

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) using CREATE, ALTER, DROP, INSERT statements.
2. Implement the queries for Updation, Selection, Deletion operations. Use ROLL BACK, COMMIT & SAVE POINTS Concepts with UPDATE, SELECT, DELETE statements.
3. Implement the queries (along with sub-Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSECT clauses.
4. Implement the queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY and HAVING clauses.
5. Implement the query to create a view and access the content of view and drop the view.
6. Develop PL/SQL program using PROCEDURE.
7. Develop PL/SQL program using FUNCTIONS.
8. Develop PL/SQL program using CURSOR.
9. Develop PL/SQL Programs using TRIGGERS.
10. Develop PL/SQL programs using PACKAGES.

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Course outcomes:

At the end of the course the student will be able to:

1. Create and maintain database using SQL.
2. Query the given database to solve given problem
3. Design database for given application.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
Sl.No	Programme Outcomes / Course Outcomes															
The students will be able to:																
1	Create and maintain database using SQL.	3	3	3		3				3	1	2	3	3		2
2	Query the given database to solve given problem.	2	3	3		3				2	1	2	3	3		2
3	Design database for given applications	2	3	3		3				3	3	3	3	3		3

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – IV

Object Oriented Programming with Java Lab

Course Code:	21UCS406L	CIE Marks	50
Teaching Hours/Week (L:T:P)	**(0:0:2)**	SEE Marks	50
Credits	01	Exam Hours	03

Course objectives:

This course will enable students to

1. To introduce java compiler and eclipse platform.
2. To impart hands on experience with java programming.

Assignment List

1. Develop simple java programs to demonstrate the
   i) Use of conditional statements
   ii) Use of loop statements
   iii) Reading & printing different data types in java
   iv) Operations on arrays (single & multidimensional

2. Develop simple java programs to demonstrate
   i) Inheritance
   ii) Polymorphism
   iii) Packages
   iv) Interfaces

3. Develop simple java programs to demonstrate exception handling

4. Develop simple java programs to demonstrate multithreading concept
   i) Creating threads using extends & runnable technique
   ii) Synchronization
   iii) Interthread Communication

5. Develop simple java programs that demonstrates the use of
   i) String library functions

6. Develop simple JDBC programs
   i) Statement Object
   ii) Prepared Statement Object
   iii) Callable Statement Object.

Revised Bloom's Taxonomy Level L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Course outcomes:

At the end of the course the student will be able to:

- Analyse the problem statement and determine the requirements for solving problem.
- Design and develop effective solution for the problem given.
- Utilize modern tools to create java applications to solve real world problems

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
Sl.No	Programme Outcomes / Course Outcomes															
The students will be able to:																
1	Analyse the problem statement and determine the requirements for solving problem.	2	3	3		3							3	3	1	2
2	Design and develop effective solution for the problem given.	2	3	3		3				2			3	3	1	3
3	Utilize modern tools to create java applications to solve real world problems.	1	2	2	1	3						1	2	1	2	1

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – IV

Operating Systems Lab

Course Code:	**21UCS407L**	CIE Marks	50
Teaching Hours/Week (L:T:P)	**(0:0:2)**	SEE Marks	50
Credits	01	Exam Hours	03

Course objectives:

This course will enable students to

- To have insights into design and implementation of resource management policies of operating systems.
- To have proficiency in concurrent programming.

Assignment List

1. Implementation of scheduling policies
2. Implementation of memory allocation techniques.
3. Developing solutions for deadlock problems.
4. Implementation of page replacement policies.
5. Developing concurrent applications using processes (Petersons algorithm).
6. Demonstration of synchronization using semaphores.
7. Implementation of Unix like shell commands.
8. Developing concurrent applications using Threads.

Revised Bloom's Taxonomy Level L_1 –Remembering, L_2 – Understanding. L3 –Applying, L4-Analysing

Course outcomes:

At the end of the course the student will be able to:

- Simulate and demonstrate different functionalities of operating system
- Implement Unix like Shell commands.
- Develop simple applications using concurrent programming.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
Sl.No	Programme Outcomes / Course Outcomes															
The students will be able to:																
1	Simulate and demonstrate different functionalities of operating system	2	2	2										1		3
2	Implement Unix like Shell commands.	2	2	2										1		3
3	Develop simple applications using concurrent programming	2	3	3										1		3

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – IV

Summer Internship

Course Code:	**21UCS408I**	CIE Marks	**-**
No Of Weeks:	**3**	SEE Marks	**100**
Credits	02	Total Hours	**(7*6)*3**

Course objectives:

This course will enable students to

- To have an insight into the basics of Linux Operating System and C programming concepts.
- To enhance the programming skills using C language.

Workshop Schedule details

Regular students will undergo Internship after completing first year,
lateral entry students will undergo Internship after completing third semester
Duration :3 weeks
Week 1: Parent department
Week 2 & Week 3 other department

Timing: Morning Session :9.00 am to 1.00 noon
Afternoon Session :2.00 pm to 5.30 pm
Total number of Hours=3weeks*7daya*7 hrs=147 hours

Course content

Sl. No.	Topics	Duration in Days
1	Linux basics, Linux commands, Exercise and Presentation on the topics	1
2	**Strings:** Introduction, Declaring and initializing string variables, String-handling functions, Example programs.	1
3	**User-defined functions:** Introduction, Need for user-defined functions, Elements of user-defined functions, Definition of functions, Return values and their types, Function calls, Function declaration, Category of functions: Based on call by value, call by reference, arguments, and return type and recursion, Example programs.	
4	**Structures:** Defining a structure, declaring structure variables, Accessing structure members, Initialization, Arrays of structure, Arrays within structures, Structures within structures, Example programs.	**1**
5	**Pointers:** Introduction, pointers for Inter-function communication, pointers to pointers, compatibility, Pointer applications, Arrays and pointers, pointer arithmetic and arrays, passing an array to a function, Memory allocation functions, Structures and Pointers, Array of pointers, pointers to void and pointers to functions, Command line arguments, linked lists.	1
6	**Bitwise operators:** Exact size integer types, logical bitwise operators, shift operators, masks, Variable argument list functions	**1**
7	**Files:** Text Input/output: files, streams, standard library I/O functions, formatting I/O functions, character I/O functions Binary files: Text v/s binary stream, standard library function for files, converting file types	

Internship Evaluation

Sl. No	Component	Marks	Mode of evaluation
1	Week 1	25	Quizzes
2	Week 2	25	Evaluation by other departments with respective parameters/assessment methods
3	Week 3	25	
4	Presentation and Report	25	Presentation by the student, sharing the experience gained through the internship, supported by the report, in the given format.
Total		**100**	

Course outcomes:

At the end of the course the student will be able to:

- Comprehend and work with the Linux Operating System.
- Understand C programming concepts like pointers, structures, and files.
- Apply the knowledge of C programming concepts to implement the given requirement specification to solve simple problems.
- Implement, interpret, debug and test any given C program.
- Develop simple applications using advanced C programming concepts to solve simple problems.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
Sl.No	**Programme Outcomes / Course Outcomes**															
The students will be able to:																
1	Comprehend and work with the Linux Operating System.					2				2			2	3		
2	Understand C programming concepts like pointers, structures, and files.	3	2												2	
3	Apply the knowledge of C programming concepts to implement the given requirement specification to solve simple problems.	3	3	3	3					2			2	3	3	2
4	Implement, interpret, debug and test any given C program.	3	2	3	3					2			2	3	3	2
5	Develop simple applications using advanced C programming concepts to solve simple problems.		3	3	3								3	3	3	3

B.E (COMPUTER SCIENCE AND ENGINEERING)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

SEMESTER – IV

Samskruthika Kannada

Course Code:	**21UHS322C/21UHS422C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	**(1:0:0)**	SEE Marks	50
Credits	01	Hours	15

Course objectives:

This course will enable students to:

- ‘¸ÁA¸ÀÌøwPÀ PÀ£ÀßqÀ’ ¥ÀoÀåzÀ ªÀÄÆ®PÀ «zÁåyðUÀ¼À°è PÀ£ÀßqÀ £ÁqÀÄ, £ÀÄr, ¨sÁµÉ, ªÀÄvÀÄÛ PÀ£ÀßrUÀgÀ ¸ÁA¸ÀÌøwPÀ §zÀÄQ£À §UÉUÉ CjªÀÅ ªÀÄÆr¸ÀÄªÀÅzÀÄ
- «zÁåyðUÀ¼À°è÷PÀ£ÀßqÀ ¨sÁµÉ ºÁUÀÆ CzÀPÉÌ ¥ÀÆgÀPÀªÁVgÀÄªÀ PÀ£ÀßqÀ ªÁåPÀgÀuÁA±ÀUÀ¼À §UÉUÉ CjªÀÅ ªÀÄÆr¸ÀÄªÀÅzÀÄ. ¥ÁæzÉÃ²PÀ ¨sÁµÉAiÀÄ°è Cfð ªÀÄvÀÄÛ ¥ÀvÀæªÀåªÀºÁgÀUÀ¼À£ÀÄß ¸ÀªÀÄxÀðªÁV ¤ªÀð»¸À®Ä ¥ÉæÃgÉÃ¦¸ÀÄªÀÅzÀÄ.
- vÁAwæPÀ CzsÀåAiÀÄ£ÀzÀ «zÁåyðUÀ¼À°è PÀ£ÀßqÀ ¨sÁµÉAiÀÄ §gÀªÀtÂUÉ ªÀÄvÀÄÛ §gÀªÀtÂUÉAiÀÄ¯ÁèUÀÄªÀ zÉÆÃµÀUÀ¼À£ÀÄß UÀÄgÀÄw¸ÀÄªÀ ¸ÁªÀÄxÀåðªÀ£ÀÄ ¨É¼É¸ÀÄªÀÅzÀÄ
- «zÁåyðUÀ¼À°è CqÀVgÀÄªÀ ¸ÀÄ¥ÀÛ ¥Àæw¨sÉAiÀÄ£ÀÄß C£ÁªÀgÀtUÉÆ½¸ÀÄªÀ ¤nÖ£À°è CªÀgÀ°è PÀ¯É, §gÀªÀtÂUÉ ªÀÄvÀÄÛ ¨sÁµÁAvÀgÀPÀ¯ÉAiÀÄ° èD¸ÀQÛAiÀÄ£ÀÄß ªÀÄÆrü¸ÀÄªÀÅzÀÄ. J®èPÀÆÌ ªÉÄÃ¯ÁV ªÀiÁ£À«ÃAiÀÄ ªÀiË®åUÀ¼ÉÆA¢UÉ ¸ÀªÁðAVÃtªÁV ¸ÀAªÀzsÀð£ÉUÉÆ½¹ CªÀgÀ£ÀÄß gÁµÀÖçzÀ CªÀÄÆ®å ¸ÀA¥ÀvÀÛ£ÁßV gÀÆ¦¹¸ÀÄªÀÅzÀÄ

Unit -1 (4 Hours)

PÀ£ÁðlPÀ ¸ÀA¸ÀÌÈw : ºÀA¥À £ÁUÀgÁdAiÀÄå

PÀ£ÁðlPÀzÀ KQÃPÀgÀt : MAzÀÄ C¥ÀÇªÀð ZÀjvÉæ - f. ªÉAPÀl¸ÀÄ§âAiÀÄå

DqÀ½vÀ ¨sÁµÉAiÀiÁV PÀ£ÀßqÀ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ¥ÉÆæ. ವಿ. ಕೇಶವಮೂರ್ತಿ

Revised Bloom’s Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying , L4-Analysing

Unit II (4 Hours)

ªÀZÀ£ÀUÀ¼ÀÄ : ಜೀಡರ ದಾಸಿಮಯ್ಯ, ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ,

QÃvÀð£ÉUÀ¼ÀÄ : vÀ®ètÂ¸À¢gÀÄ PÀAqÀå vÁ¼ÀÄ ªÀÄ£À²É - PÀ£ÀPÀzÁ¸À

vÀvÀé¥ÀzÀUÀ¼ÀÄ : ¸Á«gÀ PÉÆqÀUÀ¼À ¸ÀÄlÄÖ - ²±ÀÄ£Á¼À µÀjÃ¥sÀ

d£À¥ÀzÀ VÃvÉ : ©Ã¸ÀÄªÀ ¥ÀzÀ

Revised Bloom’s Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying , L4-Analysing

Unit III (4 Hours)

ªÀÄAPÀÄwªÀÄä£À PÀUÀÎ : r.«.f.

PÀÄgÀÄqÀÄ PÁAZÁuÁ : zÀ.gÁ. ¨ÉÃAzÉæ

ಹೊಸಬಾಳಿನ ಗೀತೆ : PÀÄªÉA¥ÀÅ

ಚೋಮನ ಮಕ್ಕಳ ಹಾಡು : ಸಿದ್ಧಲಿಂಗಯ್ಯ

ಆ ಮರ ಈ ಮರ : ಚಂದ್ರಶೇಖರ ಕಂಬಾರ

Revised Bloom’s Taxonomy Level	L_1 –Remembering, L_2 – Understanding. L3 –Applying , L4-Analysing

Unit IV (4 Hours)

qÁ. ¸Àgï JA «±ÉéÃ±ÀégÀAiÀÄå – ªÀåQÛ ªÀÄvÀÄÛ LwºÀå :J J£ï ªÀÄÆwðgÁªï

PÀgÀPÀÄ±À® PÀ¯ÉUÀ¼ÀÄ ªÀÄvÀÄÛ ¥ÀgÀA¥ÀgÉAiÀÄ «eÁÕ£À : PÀjÃUËqÀ ©ÃZÀ£ÀºÀ½î

‘PÀ’ ªÀÄvÀÄÛ ‘§’ §gÀºÀ vÀAvÁæA±ÀUÀ¼ÀÄ ಮತ್ತು PÀ£ÀßqÀzÀ mÉÊ¦AUï

Revised Bloom's Taxonomy Level	L_1 –Remembering, L_2 – Understanding, L3 –Applying , L4-Analysing

Course outcomes:

At the end of the course the student will be able to:

1. «zÁåyðUÀ¼ÀÄ ¨Ë¢ÞPÀªÁV ¨É¼ÉAiÀÄÄªÀÅzÀgÉÆA¢UÉ £ÀªÀÄä £Ár£À ªÀÄvÀÄÛ zÉÃ±ÀzÀ ¸ÁA¸ÀÌøwPÀ ªÁgÀ¸ÀÄzÁgÀgÁV ¨É¼ÉzÀÄ ¸ÁéªÀ®A©AiÀiÁV §zÀÄPÀÄ PÀnÖPÉÆ¼ÀÄîvÁÛgÉ.
2. PÀ£ÀßqÀ ¨sÁµÉAiÀÄ£ÀÄß ¸ÀªÀÄxÀðªÁV ªÀiÁvÀ£ÁqÀÄªÀÅzÀgÉÆA¢UÉ, C£ÀågÀ£ÀÄß CxÉÊð¹PÉÆ¼ÀÄîªÀ ªÀÄ£ÉÆÃ§® ¨É¼É¹PÉÆ¼ÀÄîvÁÛ£É. EªÀwÛ£À ¸ÀAQÃtðªÁzÀ ¸ÁªÀiÁfPÀ ªÀåªÀ¸ÉÜAiÀÄ°è ¸Ë°ÁzÀðAiÀÄÄvÀªÁzÀ £ÀqÀÄªÀ½PÉAiÉÆA¢UÉ ¸ÀA¥À£ÀÆä® ªÀåQÛAiÀiÁV gÀÆ¥ÀÄUÉÆ¼ÀÄîvÁÛ£É.
3. eÁUÀwPÀgÀtzÀÀ ¸ÀAzÀ¨sÀðzÀ°è «zÁåyðUÀ¼ÀÄ ¸ÀévÀAvÀæöªÁV D¯ÉÆÃa¸ÀÄªÀ, ¸ÀévÀAvÀæªÁV §gÉAiÀÄÄªÀ, ¸ÀévÀAvÀæªÁV aAvÀ£Ã²Ã®gÁUÀÄªÀ ¸ÁªÀÄxÀåðªÀ£ÀÄß ¥ÀqÉzÀÄ, ¸ÀªÀÄAiÉÆÃavÀªÁV ¸ÀÆPÀÛ ¤zsÁðgÀUÀ¼À£ÀÄß PÉÊUÉÆ¼ÀÄîªÀ°è F CzsÀåAiÀÄ£À ¢Ã¥À¸ÀÜA§ªÁVzÉ.
4. «zÁåyðUÀ¼ÀÄ EA¢£À eÁUÀwPÀ «zÀåªÀiÁ£ÀUÀ¼À£ÀÄß CxÉÊð¹PÉÆAqÀÄ, ¸ÀªÀiÁdzÀ°è ¸ÀAWÀfÃ«AiÀiÁV ¨É¼ÉAiÀÄÄªÀ ªÀÄ£ÉÆÃ§®ªÀ£ÀÄß ªÀÄvÀÄÛ DvÀä¸ÉÛöÊAiÀÄðªÀ£ÀÄß vÀÄA§ÄªÀ°è F CzsÀåAiÀÄ£À ¸ÀÆPÀÛªÁzÀ ªÀiÁUÀðzÀ²ðPÉAiÀiÁVzÉ.
5. vÀ£Àß C¹ävÉAiÀÄ ºÀÄqÀÄPÁlzÀ°ègÀÄªÀ ªÀåQÛUÉ, CzÀÄ F £É®zÀ ¸Áé©üªÀiÁ£À, ¨sÁvÀÈvÀé, ¦æÃw, ¸ËºÁzÀðAiÀÄÄvÀªÁzÀ ªÀÄ£À¸ÀÄìUÀ¼À°è Ez JA§ÄzÀ£ÀÄß «zÁåyðUÀ¼À CjvÀPÉÌvÀgÀÄvÀÛzÉ. «zÁåyðUÀ¼À°è ¥Àj¸ÀgÀ ¥ÀæeÉÕAiÀÄ£ÀÄß eÁUÀÈvÀUÉÆ½¹, zÉÊªÀ¸ÀÈ¶ÖAiÀiÁzÀ F CªÀÄÆ®å ¸ÀA¥ÀvÀÛ£ÀÄß »vÀ-«ÄvÀªÁV §¼À¹PÉÆAqÀÄ ªÀÄÄA¢£À vÀ¯ÉªÀiÁjUÉ CzÀ£ÀÄß §¼ÀÄªÀ½AiÀiÁV ©lÄÖºÉÆÃUÀÄªÀ°è eÁUÀÈvÀ£ÁUÀÄvÁÛ£É.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books				
1	**¥ÀoÀå¥ÀÄ¸ÀÛPÀ:** ¸ÁA¸ÀÌøwPÀ PÀ£ÀßqÀ (¸ÀA), qÁ.».a.¨ÉÆÃgÀ°AUÀAiÀÄå & qÁ.J¯ï.wªÉÄäÃ±À, Prasaranga VTU, Belagavi, Karnataka, 2020.			

Eligibility criteria :

For registration of Kannada subject: students who have studied Kannada language as one of the subjects either in tenth standard or PUC-II have to register Samskruthika Kannada.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

Programme Outcomes		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
The students will be able to:																
1																
2											2					
3							1									
4							2									
5							1	3								

Total: L-15Hours

ಪಠ್ಯಪುಸ್ತಕ:

Prescribed Textbook:

ಬಳಕೆ ಕನ್ನಡ –"BaLake Kannada" -

Author : Dr. L Thimmesha
Published by Prasaranga,
Visvesvaraya Technological University, Belagavi, Karnataka.

ಕೋರ್ಸ್ ಫಲಿತಾಂಶಗಳು:

At the end of the course the student should be able to:

1. ವಿದ್ಯಾರ್ಥಿಗಳು ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಸುಲಭವಾಗಿ ಅರ್ಥೈಸಿಕೊಂಡು, ಸಾಮಾಜಿಕವಾಗಿ, ಆರ್ಥಿಕವಾಗಿಆಯಾ ಪ್ರದೇಶದಜನರೊಂದಿಗೆ ಅನ್ಯೋನ್ಯವಾಗಿ ವ್ಯವಹರಿಸುತ್ತಾರೆ.
2. ಈ ಪಠ್ಯಾಧ್ಯಯನದಿಂದ ವಿದ್ಯಾರ್ಥಿಯುಆಯಾ ಪ್ರದೇಶಗಳ ನಂಬಿಕೆ, ಸಂಪ್ರದಾಯ ಮತ್ತು ಆಚರಣೆಗಳನ್ನು ಸುಲಭವಾಗಿ ಅರ್ಥಮಾಡಿಕೊಳ್ಳಲು ಸಾಧ್ಯವಾಗುತ್ತದೆ.
3. ಕನ್ನಡ ಸಂಖ್ಯೆಗಳ ಪರಿಕಲ್ಪನೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಯು ವಾಣಿಜ್ಯ ವ್ಯವಹಾರಗಳನ್ನು ಸುಲಭವಾಗಿ ನೆರೆವೇರಿಸಲು ಸಾಧ್ಯವಾಗುತ್ತದೆ.
4. ಹಂತಹಂತವಾಗಿ ವಿದ್ಯಾರ್ಥಿಯು ಕನ್ನಡ ಭಾಷೆಯಲ್ಲಿ ಬರವಣಿಗೆಯಕಲೆಯನ್ನು ಮತ್ತುಓದುವಕಲೆಯನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುತ್ತಾನೆ.
5. ಈ ಭಾಷೆಯ ಸಂಪರ್ಕದಿಂದಾಗಿ ವಿದ್ಯಾರ್ಥಿಯು ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪ್ರಕಾರಗಳಾದ ಕತೆ, ಕವನ, ಕಾದಂಬರಿ, ನಾಟಕ ಮುಂತಾದ ಕ್ಷೇತ್ರಗಳಲ್ಲಿ ತನ್ನ ಅಭಿರುಚಿಯನ್ನು ಹೆಚ್ಚಿಸಿಕೊಳ್ಳುತ್ತಾನೆ

Note:

Eligibility criteria for registration of Kannada subjects: students who have not studied Kannada language as one of the subject in tenth standard or PUC-II have to register Balake Kannada.

CO-PO Mapping

CO	PO	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1										2				
CO2										2				
CO3										3				
CO4										2				
CO5										2				