III Semester

(Applicable students admitted during AY 2020-21 to 1st semester and Lateral Entry AY 2021-22 to 3rd semester)

Sl. No.	Subject Code	Subject	Credits	Hours/Week			Examination Marks		
				Lecture	Tutorial	Practical	CIE	SEE	Total
1	UMA391C	Numerical Techniques & Integral Transforms	03	3	0	0	50	50	100
2	UIS309C	Discrete Mathematical Structures	03	3	0	0	50	50	100
3	UIS315C	Data Structures and Algorithms	04	3	2	0	50	50	100
4	UIS303C	Logic Design	04	3	2	0	50	50	100
5	UIS314C	Computer Organization	04	4	0	0	50	50	100
6	UIS313L	Advanced C Programming Lab	02	0	2	2	50	50	100
7	UIS312L	Logic Design & Simulation Laboratory	1.5	0	0	3	50	50	100
8	UIS308L	Data Structures Laboratory	1.5	0	0	3	50	50	100
9	UMA330M	Bridge Course Mathematics-I *	--	3	0	--	50	50	100
10	UBT133M	Environmental Studies *	--	2	--	--	50	50	100
		Total	**23**	**21**	**6**	**8**	**500**	**500**	**1000**

• **Bridge Course Mathematics-I**	:	is a mandatory subject only for students admitted to 3rd Semester through lateral entry scheme (Diploma quota). Passing the subject is compulsory, however marks will not be considered for awarding grade/class. A PP/NP grade will be awarded for passing/not passing the subject.
• **Environmental Studies**	:	is amandatory subject for lateral entry students. Question Paper will be of Objective type. Students have to pass the subject compulsorily, however marks will not be considered for awarding Grade / Class / Rank.
		*A student can register online certification course for a maximum of 3 credits from 3rd to 6th semester. However he has to produce the certificate during 7th semester. A student can register 3 courses of 1 cr each/2 courses of 2 cr and 1 cr/1 course of 3 cr in any semester.

IV Semester

(Applicable students admitted during AY 2020-21 to 2nd semester and Lateral Entry AY 2021-22 to 4th semester)

Sl. No.	Subject Code	Subject	Credits	Hours/Week			Examination Marks		
				Lecture	Tutorial	Practical	CIE	SEE	Total
1	UMA491C	Statistics and Probability Distributions	03	3	0	0	50	50	100
2	UIS409C	Microcontroller and Embedded Systems	03	3	0	0	50	50	100
3	UIS424C	OOP with Java	04	4	0	0	50	50	100
4	UIS415C	Operating Systems	03	3	0	0	50	50	100
5	UIS403C	Analysis and Design of Algorithms	04	3	2	0	50	50	100
6	UHS001N	Fundamentals of Quantitative Aptitude & Soft skills	01	2	0	0	50	50	100
7	UIS421L	Analysis of Algorithms using JAVA Laboratory	1.5	0	0	3	50	50	100
8	UIS410L	Microcontroller and Embedded Systems Laboratory	1.5	0	0	3	50	50	100
9	UMA430M	Bridge Course Mathematics-II *	--	3	0	0	50	50	100

10	UHS226M	Constitution of India *	--	2	--	--	50	50	100
11	UHS488C/ UHS489C	Samskruthika Kannada# / Balake Kannada$	01	2	--	--	50	50	100
12	UHS004M	Universal Human Values *	--	2	--	--	50	50	100
		Total	**22**	**27**	**2**	**6**	**450**	**450**	**900**

• **Bridge Course Mathematics –II**	:	is a mandatory subject only for students admitted to 4thSemester through lateral entry scheme (Diploma quota). Passing the subject is compulsory, however marks will not be considered for awarding grade /class. A PP/NP grade will be awarded for passing/not passing the subject.
• **Constitution of India**	:	is a mandatory subject for lateral entry students. Question Paper will be of Objective type. Students have to pass the subject compulsorily, however marks will not be considered for awarding Grade / Class /Rank. ∗ Samskrutika Kannada/Balake Kannada is a mandatory subject the student has to study the subject but no exam ∗ A student can register online certification course for a maximum of 3 credits from 3rd to 6th semester. However he has to produce the certificate during 7th semester. A student can register 3 courses of 1 cr each/2 courses of 2 cr and 1 cr/1 course of 3 cr in any semester.

* is a mandatory subject passing the subject is compulsory; however marks will not be considered for
awarding grade/class. A PP/NP grade will be awarded for passing/not passing the subject.

Scheme of Teaching and Evaluation
V Semester
**(Applicable students admitted during AY 2020-21 to 1st semester and Lateral Entry AY 2021-22 to
3rd semester, 2022-23 5th semester)**

Sl. No.	Subject Code	Subject	Credits	Hours/Week			Examination Marks		
				Lecture	Tutorial	Practical	CIE	SEE	Total
1	UIS513C	Web Programming	03	3	0	0	50	50	100
2	UIS510C	Software Engineering	03	3	0	0	50	50	100
3	UIS503C	Database Management Systems	04	3	2	0	50	50	100
4	UIS514C	Theoretical Foundations of Computer Science	03	3	0	0	50	50	100
5	UISXXXE	**Professional Elective – I**	03	3	0	0	50	50	100
6	UISXXXN/ UISXXXN/	**Open Elective-I**	03	3	0	0	50	50	100
7	UIS511L	Database Application Laboratory	1.5	0	0	3	50	50	100
8	UIS517L	Web Programming Lab	1.5	0	1	2	50	50	100
9	UHS002N	Advanced Quantitative Aptitude And Soft Skills	01	0	0	0	50	50	100
		Total	**23**	**18**	**3**	**5**	**450**	**450**	**900**

Note: For electives refer the table: List of Electives (3 Credits)

*A student can register online certification course for a maximum of 3 credits from 3rd to 6th semester.
However he has to produce the certificate during 7th semester. A student can register 3 courses of 1 cr
each/2 courses of 2 cr and 1 cr/1 course of 3 cr in any semester.

Electives Offered	
Subject Code	Subject Title
UIS047E	Data Science using Python

Open Electives Offered	
Subject Code	Subject Title
UIS531N	Software Engineering
UIS532N	Java Programming

VI Semester
(Applicable students admitted during AY 2020-21 to 2nd semester and Lateral Entry AY 2021-22 to 4th semester, 2022-23 6th semester)

Sl. No.	Subject Code	Subject	Credits	Hours/Week			Examination Marks		
				Lecture	Tutorial	Practical	CIE	SEE	Total
1	UIS607C	Software Testing	03	3	0	0	50	50	100
2	UIS623C	Computer Networks	04	3	2	0	50	50	100
3	UIS00XX	**Professional Elective- II**	03	3	0	0	50	50	100
4	UIS00XX	**Professional Elective – III**	03	3	0	0	50	50	100
5	UIS00XX	**Open Elective– II**	03	3	0	0	50	50	100
6	UIS612L	Computer Network Laboratory	1.5	0	0	3	50	50	100
7	UIS616L	Advanced Java Programming laboratory	1.5	0	0	3	50	50	100
8	UIS614P	Mini Project	02	0	0	3	50	50	100
9	UHS003N	Career Planning and Professional Skills	01	2	0	0	50	50	100
		Total	**22**	**17**	**2**	**9**	**450**	**450**	**900**

Note: For electives refer the table: List of Electives (3 Credits)

*A student can register online certification course for a maximum of 3 credits from 3rd to 6th semester. However he has to produce the certificate during 7th semester. A student can register 3 courses of 1 cr each/2 courses of 2 cr and 1 cr/1 course of 3 cr in any semester.

Electives Offered	
Subject Code	Subject Title
UIS048E	Advanced Java Programming
UIS042E	Advanced Algorithms

Open Electives Offered	
Subject Code	Subject Title
UIS002N	Database Management System

Scheme of Teaching and Evaluation

VII Semester

(Applicable students admitted during AY 2020-21 to 1ˢᵗ semester and Lateral Entry AY 2021-22 to 3ʳᵈ semester,

2022-23 5ᵗʰ semester, 2023-24 7ᵗʰ Semester)

Sl. No.	Subject Code	Subject	Credits	Hours/Week			Examination Marks		
				Lecture	Tutorial	Practical	CIE	SEE	Total
1	UIS710C	Object Oriented Modeling and Design	03	3	0	0	50	50	100
2	UIS00XC	Computer Networks	03	3	0	0	50	50	100
3	UIS00XX	Professional Elective – IV	03	3	0	0	50	50	100
4	UIS00XX	Professional Elective – V	03	3	0	0	50	50	100
5	UIS00XX	Open Elective– III	03	3	0	0	50	50	100
6	UIS707L	Object Oriented System Design Lab	1.5	0	1	2	50	50	100
7	UISXXXL	Computer Networks Lab	1.5	0	1	2	50	50	100
8	UIS718I	Internship	02	0	0	4	50	50	100
9	UISXXXO	Online Certification Course registration	03						
		Total	**23**	**15**	**2**	**8**	**400**	**400**	**800**

*A student can register online certification course for a maximum of 3 credits from 3ʳᵈ to 6ᵗʰ semester. However he has to produce the certificate during 7ᵗʰ semester. A student can register 3 courses of 1 cr each/2 courses of 2 cr and 1 cr/1 course of 3 cr in any semester.

Open Elective – III: Machine Learning / Artificial Intelligence

VIII Semester

(Applicable students admitted during AY 2020-21 to 2ⁿᵈ semester and Lateral Entry AY 2021-22 to 3ʳᵈ semester,
2022-23 6ᵗʰ semester, 2023-24 8ᵗʰ Semester)

Sl. No.	Subject Code	Subject	Credits	Hours/Week			Examination Marks		
				Lecture	Tutorial	Practical	CIE	SEE	Total
1	UISXXXH	Management & Entrepreneurship (HSS)	03	4	0	0	50	50	100
2	UISXXXH	Startup and IPR (HSS)	03	3	0	0	50	50	100
3	UIS806P	Project	15	0	0	0	50	50	100
4	UIS807S	Seminar	01	0	0	2	50	50	100
		Total	**22**	**7**	**0**	**2**	**200**	**200**	**400**

Bridge Course Mathematics –I/II: is a mandatory subject only for students admitted to 3rd and 4thSemester through lateral entry scheme Diploma quota). Passing the subject is compulsory, however marks will not be considered for awarding grade /class. A PP/NP grade will be awarded for passing/not passing the subject.

Constitution of India/Environmental Studies: is a mandatory subject for lateral entry students 3/4. Question Paper will be of Objective type. Students have to pass the subject compulsorily, however marks will not be considered for awarding Grade / Class /Rank.

* Samskruthika Kannada# / Balake Kannada$ is a mandatory subject the student has to study the subject but no exam

*A student can register online certification course for a maximum of 3 credits from 3rd to 6th semester. However he has to produce the certificate during 7th semester. A student can register 3 courses of 1 cr each/2 courses of 2 cr and 1 cr/1 course of 3 cr in any semester

3rd Semester 175 Credits

Subject Title	:	**Numerical Techniques and Integral Transforms**
Subject code	:	**UMA391C**
Semester	:	**3**
Credits with LTP Structure	:	**3 Credits (3L-0T-0P)**
Lecture Hours per Week	:	**3 Hours**
Tutorial Hours per Week	:	**0 Hours**
Total Contact Hours	:	**40 (40 Teaching Hours + 00 Tutorial Hours)**

Course Outcomes:

After completing the course the student will be able to:

1. The ability to solve engineering problems using non-linear equations and interpolation techniques.
2. The ability to solve problems using numerical differention and numerical integration.
3. Be capable to perform numerical solutions of ordinary differential equations.
4. Fourier analysis provides a set of mathematical tools which enable the engineer to break down a wave into its various frequency components. It is then possible predict the effect of a particular waveform.
5. It is essential to understand the basic concepts of Fourier transforms and z –transforms, to solve ode, pde and difference equations.

UNIT - I	10 Hours	Teaching Hours	Tutorial 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).		10	00
UNIT - II	10 Hours	Teaching Hours	Tutorial 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.		10	00
UNIT - III	10 Hours	Teaching Hours	Tutorial 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.		10	00
UNIT - IV	10 Hours	Teaching Hours	Tutorial 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.		10	00

Text Books:

1. Numerical Methods for Engineers by Steven C Chapra & Raymond P Canale.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers, New Delhi.
3. Advanced Engineering Mathematics By H. K. Das, S. Chand & company Ltd. Ram Nagar, New Delhi.

Reference Books:

1. Advanced Engineering Mathematics by E Kreyszig   (John Wiley & Sons)

Subject Title	:	**Discrete Mathematical Structures**
Subject code	:	UIS309C
Semester	:	3
Credits with LTP Structure	:	3 Credits (3L-0T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	40 (40 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:
1. Apply elementary counting techniques to solve problems.
2. Validate logical statements in terms of predicate, quantifiers and logical connectives.
3. Apply the laws of set theory in solving problems.
4. Identify various properties of relations and functions.
5. Apply theorems and algorithms of graph theory in solving engineering and societal problems.

UNIT - I	10 Hours	Teaching Hours	Tutorial Hours
Fundamentals Principles of Counting: The Rules of sum and product, permutations, combinations: the binomial theorem, combinations with repetition, mathematical induction, recursive definitions. **Recurrence relation**: first order linear recurrence relation, the second order linear homogeneous recurrence relation with constant coefficient		**10**	**00**

UNIT - II	10 Hours	Teaching Hours	Tutorial Hours
Fundamentals of Logic: Basic connectives and truth tables, Logical equivalence: the laws of logic, logical implication: rules of inference, the use of quantifiers, quantifiers, definitions and the proofs of theorems. **Set Theory:** Sets and subsets, set operations and the laws of set theory, counting and Venn Diagrams, probability, the axioms of probability.		**10**	**00**

UNIT - III	10 Hours	Teaching Hours	Tutorial Hours
Relations and Functions: Cartesian products and relations, functions: plain and one to one, on to functions: sterling numbers of the second kind, special functions, the pigeonhole principle, function composition and inverse functions, properties of relations, computer recognition: zero one matrices and directed graphs, partial order: Hasse diagram, equivalence relations and partitions, lattices. **Semigrops and Groups**: Definition, example and elementary properties, Homomorphism, Isomorphism and cyclic groups, Cosets and lagrange's theorem		**10**	**00**

UNIT - IV	10 Hours	Teaching Hours	Tutorial Hours
An introduction to graph theory: Definitions and examples, subgraphs, complement and graph isomorphism, vertex degree: Euler trails and circuits**.** **Trees:** definitions, properties and examples, rooted trees, trees and sorting weighted trees and prefix codes		**10**	**00**

Text Books:

1. "Discrete and Combinatorial Mathematics-An Applied Introduction", Ralph P Grimaldi, Pearson Education, 4th and 5th Edition

Reference Books:

1. C.L.Lin, "Elements of Discrete Mathematics" 2nd Editions
2. Thomas Khoshy "Discrete Mathematics with applications"
3. Richard Johasonbangh "Discrete Mathematics" 6th Edition
4. Kenneth H rossey "Discrete Mathematics & etc applications" 6th edition

Subject Title	:	Data Structures & Algorithms
Subject code	:	UIS315C
Semester	:	3
Credits with LTP Structure	:	4 Credits (3L-1T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	2 Hours
Total Contact Hours	:	66 (40 Teaching Hours + 26 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:

1. Write C programs using   advanced C programming concepts.
2. Develop algorithms to simulate various linear   data structures like stack, queues and linked lists.
3. Implement C programs using recursion to solve various problems.
4. Develop algorithms to simulate non linear data structures like Binary tree, Binary search tree.
5. Implement open-ended applications using linear and non-linear data structures

UNIT - I	16 Hours	Teaching Hours	Tutorial Hours
Introduction to data structures: Structures in C. **The stack**: Definition and Examples: Primitive operations, An Example, The stack as an Abstract data type. , Representing Stacks in C: Implementing pop operation, Testing for exceptional conditions, Implementing the push operations. , An Example- Infix, Postfix and Prefix: Basic Definitions and Examples, Evaluating a postfix expression, Program to evaluate a postfix expression, Limitations of the program, Converting an expression from Infix to Postfix, Program to convert an expression from Infix to Postfix. **Recursion**: Recursive definition and processes: The factorial function, Properties of recursive definitions or Algorithms. , Recursion in C: Factorial in C., writing recursive programs: The Towers of Hanoi Problem.		10	6

UNIT - II	16 Hours	Teaching Hours	Tutorial Hours
Queues: *The queue and its sequential representation*: The queue as an abstract data type, C implementation of queues, The insert operation, The priority queue, Array implementation of a priority queue**.** **Lists:** *Linked lists*: Inserting and removing nodes from a list, Linked implementation of stacks, The getnode and freenode operations, Linked implementation of queues, The linked list as a data structure, Examples of list operations, List implementation of priority queues, Header Nodes.		10	6

UNIT - III	17 Hours	Teaching Hours	Tutorial Hours
Lists in C: Array implementation of lists, Limitations of the array implementation, Allocating and freeing dynamic variables, Linked lists using dynamic variables, Queues as lists in C, Examples of list operations in C, Noninteger and nonhomogeneous lists, Comparing the dynamic and array implementation of lists, Implementing Header Nodes. , An example:simulation using linked lists. **Other list structures**: Circular lists, The stack as a circular list, The queue as a circular list, Primitive operations on circular lists, The Josephus problem, Header nodes, Addition of long positive integers using circular lists**.**		10	7

UNIT - IV	17 Hours	Teaching Hours	Tutorial Hours
Trees: Binary trees: Basics, Operation on Binary trees, Applications of Binary trees. Binary tree representations: Node representations of Binary trees, Node Representation of binary trees, Internal & external nodes, Implicit array representation of Binary trees, Choosing a Binary tree representation, Binary tree traversal in c, traversal using a father field, heterogeneous binary trees. *Trees and their applications*: C representation of		10	7

trees, Tree traversals, General expressions as trees, Evaluating an expression tree, Constructing tree.

Text Books:

1. "Data structure using C", Aaron M. Tennenbaum, Yedidyah Langsam and Moshe J. Augenstein, Pearson Education/PHI 2006.

Reference Books:

1. Behrouz A. Forouzan, Richard F. Gilberg, "A Structured Programming Approach Using C", Second Edition, Thomson Brooks/Cole .
2. Behrouz A. Forouzan and Richard F. Gilberg, Thomson, "Computer Science A structured Programming Approach using C", II edition, 2003.
3. Richard F. Gilberg and Behrouz, "Data structures A pseudo code approach with c ", Thomson, 2005.
4. Robert Kruse and Breuse Leung, "Data structures and program Design in C", PEARSON Education, 2007.

Subject Title	:	Logic Design
Subject code	:	UIS303C
Semester	:	3
Credits with LTP Structure	:	4 Credits (3L-1T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	2 Hours
Total Contact Hours	:	66 (40 Teaching Hours + 26 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:

1. Implement the Boolean formulas with universal gates by representing them in canonical formulas.
2. Simplify the Boolean formulas using Kmaps, Quine McClusky,decimal method, MEV method.
3. Realize the Boolean formulas using MSI components.
4. Design programmable logic devices.
5. Construct registers and counters using asynchronous and synchronous sequential circuits.

UNIT - I	16 Hours	Teaching Hours	Tutorial Hours
Boolean Algebra: Definition of Boolean algebra, Boolean algebra theorems, A two-valued Boolean algebra, Boolean formulas and functions, Canonical Formulas, Manipulations of Boolean formulas **Gates and Combinational networks**: Incomplete Boolean functions and Don't care conditions, Additional Boolean operations and Gates		10	6

UNIT - II	16 Hours	Teaching Hours	Tutorial Hours
Simplification of Boolean Expressions: Formulations of simplification problem, Prime implicants and Irredundant disjunctive expressions, Prime implicates and Irredundant conjunctive expressions, Karnaugh maps, Using Karnaugh maps to obtain minimal expressions for complete Boolean functions, Minimal expressions of incomplete Boolean functions The Quine-McCluskey method of generating Prime implicants and Prime implicates, Decimal method for obtaining prime implicants, Variable-Entered Karnaugh maps.		10	6

UNIT - III	17 Hours	Teaching Hours	Tutorial Hours
Logic Design with MSI Components and Programmable Logic Devices: Binary adders and subtracters, Decimal adders, Comparators, Decoders, Multilpexers. Programmable logic devices (PLDs), Programmable read only memories (PROMs), Programmable logic arrays (PLAs), Programmable array logics (PALs).		10	7

UNIT - IV	17 Hours	Teaching Hours	Tutorial Hours
Flip-Flops and Simple Flip-Flop Applications: The basic Bistable element, Latches, Master-Slave flip-flops (Pulse-Triggered flip-flops), Edge triggered flip-flops, Characteristic equations, Registers, Counters, Design of Synchronous Counters. **Synchronous sequential networks:** Structure and operation of clocked synchronous sequential networks, Analysis of clocked synchronous sequential networks.		10	7

Text Books:

1. Donald D. Givone, "Digital Principles and Design", McGraw Hill Edition 2002:
   Chapter 3: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9
   Chapter 4: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.8, 4.11, 4.14
   Chapter 5: 5.1, 5.2, 5.3, 5.4, 5.6, 5.7, 5.8, 5.9, 5.10
   Chapter 6: 6.1, 6.2, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9
   Chapter 7: 7.1, 7.2

Reference Books:

1. Leach and Malvino, "Digital Principles and Applications", TMH, New Delhi, 2002.
2. Yarbrough J. M, "Digital logic- Applications and Design, Thomson Learning, New Delhi, 2001.

Subject Title	:	Computer Organization
Subject code	:	UIS314C
Semester	:	3
Credits with LTP Structure	:	4 Credits (4L-0T-0P)
Lecture Hours per Week	:	4 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	52 (52 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:

1. Comprehend the fundamentals of a computing system and its functional units.
2. Write an Assembly Language Program using various types of instructions and addressing modes.
3. Comprehend and Compare the approaches to implement I/O i.e. programmed I/O, interrupt driven I/O and DMA.
4. Comprehend and design various memory organizations.
5. Understand the concepts of 2's complement representation, addition and subtraction operations with this representation, multiplication (BOOTH) and division methods.
6. Comprehend the basics of CPU organization and design of control unit.

UNIT - I	13 Hours	Teaching Hours	Tutorial Hours
Basic Structure of Computer**:** Computer Types. Functional Units, Basic Operational Concepts, Bus Structures, Performance – processor clock, Basic Performance Equation, Clock rate, Performance Measurement. Machine Instructions and Programs**:** Numbers, Arithmetic Operations and Characteristics, Memory Location and Addresses, Memory Operations. Instructions and Instruction Sequencing: Addressing Modes, Assembly language, Basic Input and Output operations, Stacks and Queues, Subroutines.		13	00

UNIT - II	13 Hours	Teaching Hours	Tutorial 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, Buses, Interface circuits, Standard I/O interfaces-USB; Device characteristics, Architecture, Addressing.		13	00

UNIT - III	13 Hours	Teaching Hours	Tutorial Hours
Basic processing unit: Fundamental concepts, Execution of a complete instruction, Multiple bus organization, Hard-wired control, Micro programmed control. Memory system**:** Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size and cost, Cache Memories, Mapping Functions.		13	00

UNIT - IV	13 Hours	Teaching Hours	Tutorial Hours
Basic Arithmetic concepts for ALU: Addition and subtraction of signed numbers, Design of fast adders; Carry-lookahead addition only, Multiplication of positive numbers, Signed operand multiplication, Fast multiplication, Integer division, Floating point numbers and operations.		13	00

Text Books:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 5th edition, TMH, 2002.

Reference Books:

1. Computer Organization and Architecture, William Stallings,7th edition,PHI,2006

Subject Title	:	**Bridge Course Mathematics-I**
Subject code	:	**UMA330M**
Semester	:	**3**
Credits with LTP Structure	:	**Mandatory**
Lecture Hours per Week	:	**3 Hours**
Tutorial Hours per Week	:	**0 Hours**
Total Contact Hours	:	**40 (40 Teaching Hours + 00 Tutorial Hours)**

Course Outcomes:

After completing the course the student will be able to:

1. Enhance learning of Engineering Mathematics.
2. Develop, understanding, stimulate their interest, and increase their proficiency in Mathematics.
3. Visualizing and representations: learners can see abstract concepts; make connections between geometry and algebra.
4. Make our teaching modules more active and improve the learning outcomes of our students.
5. Learn Engineering Mathematics conceptually and relationally in order to be able to apply, when they have learned.
6. Create inquiry based learning and an opportunity to learn, practice.

UNIT - I	15 Hours	Teaching Hours	Tutorial 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 (statements only) without proof. problems **Partial differentiation:** Introduction to function of several variables, Partial derivatives; Euler's theorem - problems. Total derivatives-differentiation of composite functions.Jacobians-problems.		**15**	**00**

UNIT - II	15 Hours	Teaching Hours	Tutorial Hours
Integral Calculus: Reduction formula $\int \sin^n x\, dx, \int \cos^n x\, dx, \int \tan^n x\, dx$ and $\int \sin^n x \cos^n x\, dx$. Evaluation of double and triple integrals. Area bounded by the curve. **Beta and Gamma functions:** Definitions, Relation between beta and gamma functions-problems.		**15**	**00**

UNIT - III	10 Hours	Teaching Hours	Tutorial Hours
Vector Calculus: **Vector Differentiation:** Scalar and vector fields**.** Gradient, directional derivative; curl anddivergence-physical interpretation; solenoidal and irrotational vector fields- problems		**10**	**00**

Text Books:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016.

Reference Books:

1. Thomas' Calculus: Early Transcendentals, Single Variable (13th Edition)
2. **Calculus:**Early TranscendentalsJames Stewart
3. C.Ray Wylie, Louis C.Barrett : "Advanced Engineering Mathematics", 6th Edition,McGraw-Hill Book Co., New York, 1995.
4. B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
5. Veerarajan T.," Engineering Mathematics for First year", Tata McGraw-Hill, 2008.
6. N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.

Subject Title	:	Environmental Studies
Subject code	:	UBT133M
Semester	:	3
Credits with LTP Structure	:	Mandatory
Lecture Hours per Week	:	2 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	26 (26 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:

1. Ability to understand basic aspects of environment and ecology.
2. Ability to recognize natural resources and its uses.
3. Able to understand pollution and its effects on environment.
4. Ability to understand current environmental issues.
5. Acquire knowledge of environmental protection acts
6. Able to apply the waste management techniques in various fields

UNIT - I	07 Hours	Teaching Hours	Tutorial Hours
Environment & Ecology: Environmental segments, Ecosystem and classification of ecosystem. Environmental Impacts of human activities: Agriculture, Transportation, Industry, Mining, Urbanization. **Natural Resources:** Forest, water, mineral, food, land resources and biodiversity, Renewable Energy: Solar energy, wind energy, Hydropower, Tidal energy, Ocean thermal energy, Geo thermal energy, Biomass energy, Biogas, Biofuels, Hydrogen as fuel. Non renewable Energy: Coal, Petroleum, Natural gas, Nuclear energy.		07	00

UNIT - II	07 Hours	Teaching Hours	Tutorial Hours
Environmental Pollution: Water pollution, water quality standards, water borne diseases, Fluoride problem, Air pollution, Noise pollution. Effect of electro magnetic waves. **Sustainable future:** Concept of sustainable development, threats to sustainability, over exploitation of resources, strategies for sustainable development. Environment education, conservation of resources. Environment economics – concept of green building, clean development mechanism (CDM).		07	00

UNIT - III	06 Hours	Teaching Hours	Tutorial Hours
Current Environmental Issues of concern: Population growth, Greenhouse Effect- Greenhouse gases and Global Warming, Climate change, ozone layer depletion, Acid rain, Eutrophication **Environmental policy legislation rules & regulations:** National environmental policy, environment protection act, legal aspects of air & water act. Functions of Government agencies.		06	00

UNIT - IV	06 Hours	Teaching Hours	Tutorial Hours
Fundamentals of Waste management L: Solid waste management: Sources, classification, characteristics, collection & transportation, disposal, and processing methods. Hazardous waste management and handling. Concept of waste water treatment, Bioremediation. Industrial waste management (Case studies: Cement, plastic, chemical, E–waste, food & construction industry waste management).		06	00

Text Books:

Reference Books:

1. Benny Joseph "Environmental Studies" Tata McGraw Hill, 2005.

2. Dr. D. L. Manjunath, "Environmental Studies" Pearson Education, 2006

3. Koushik and Koushik "Environmental Science & Engineering" New Age International
   Publishers, New Delhi, 2006

4. P. Venugopal Rao "Principles of Environmental Science & Engineering" Pranticce Hall
   of India, 2006.

5. Meenakshi "Environmental Science & Engineering" " Pranticce Hall of India, 2006.

6. S. K. Garg "Environmental Science & Ecological Studies" Khanna Publishers New Delhi,
   2007.

Subject Title	:	Statistics and Probability Distributions
Subject code	:	UMA491C
Semester	:	3
Credits with LTP Structure	:	3 Credits (3L-0T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	00
Total Contact Hours	:	40 (40 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:

1. To apply the least square sense method to construct the specific relation for the given group of data.
2. To understand the concept of probability.
3. To apply the concept of probability to find the physical significance of various distribution phenomena.
4. To understand the concepts of probability distributions.
5. To apply the concept of Markov Chain for commercial and industry purpose.

UNIT - I	10 Hours	Teaching Hours	Tutorial 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.		10	00

UNIT - II	10 Hours	Teaching Hours	Tutorial Hours
Probability: Probability: addition rule, conditional probability, multiplication rule, Baye's rule. Discrete and continuous random variables-Probability density function, Cumulative distribution function, Problems on expectation and variance		10	00

UNIT - III	10 Hours	Teaching Hours	Tutorial Hours
Probability distributions: Binomial distributions Poisson distributions and Normal distributions. Concept of joint probability, Joint probability distributions.		10	00

UNIT - IV	10 Hours	Teaching Hours	Tutorial Hours
Markov chains: 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.		10	00

Text Books:

1. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers, New Delhi.
2. Theory and problems of probability by Seymour Lipschutz (Schaum's Series).
3. Advanced Engineering Mathematics by H. K. Dass
4. Advanced Engineering Mathematics by E Kreyszig   (John Wiley & Sons)
5. Probability and stochastic processes by Roy D. Yates and David J. Goodman, wiley India pvt.ltd 2nd edition 2012.
6. Advanced Engineering Mathematics by Peter V. O'Neil.

Reference Books:

4th Semester 175 Credits

Subject Title	:	Microcontroller and Embedded Systems
Subject code	:	UIS409C
Semester	:	4
Credits with LTP Structure	:	3 Credits (3L-0T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	40 (40 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:

1. Comprehend the fundamentals of microprocessor and microcontroller architectures.
2. Develop assembly language programs for 8051 Microcontroller using Keil tool.
3. Use Timers/Counters/Interrupts components to solve engineering problems.
4. Generate various waveforms using Serial Ports for developing basic communication systems.
5. Develop appropriate interfaces to control various hardware units.

UNIT - I	10 Hours	Teaching Hours	Tutorial Hours
The 8051 Microcontrollers, Assembly Language Programming: Microcontrollers and Embedded systems, Overview of the 8051 family, Inside the 8051, Introduction to 8051 Assembly programming, Assembling and running an 8051 program, the program counter and ROM space in the 8051, 8051 data types and directives, 8051 flag bits and PSW register, 8051 register banks and stack, pin description of the 8051. **Jump, Loop and Call Instructions, I/O Port Programming**: Loop and Jump instructions, Call instructions, Time delay for various 8051 chips, 8051 I/O programming, I/O bit manipulation programming.		10	00
UNIT - II	10 Hours	Teaching Hours	Tutorial Hours
8051 Addressing Modes, Arithmetic, Logic Instructions and Programs: Immediate and register addressing modes, Accessing memory using various addressing modes, Bit addresses for I/O and RAM, Extra 128-byte-on-chip RAM in 8052. Arithmetic instructions, Signed number concepts and arithmetic operations, Logic and compare instructions, Rotate instruction and data serialization, BCD, ASCII, and other application programs.		10	00
UNIT - III	10 Hours	Teaching Hours	Tutorial Hours
8051 Programming in C, Pin description of 8051: Data types and time delay in 8051 C, I/O programming in 8051 C, Logic operations in 8051 C, Data conversion programs in 8051 C, Accessing code ROM space in 8051 C, Data serialization using 8051 C. **8051 Timer Programming in Assembly and C**: Programming 8051 timers, counter programming, Programming timer 0 and 1 in 8051 C.		10	00
UNIT - IV	10 Hours	Teaching Hours	Tutorial Hours
8051 Serial Port Programming in Assembly and C: Basics of serial communication, 8051 conversion to RS232, 8051 serial port programming in Assembly, Programming the second serial port, Serial port programming in C.		10	00

Interrupts Programming in Assembly and C: 8051 interrupts, Programming timer interrupts, Programming external hardware interrupts, Programming the serial communication interrupt, Interrupt priority in the 8051/52, Interrupt programming in C.**MOTOR Control:** DC and Stepper Motors.		

Text Books:

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, " The 8051 Microcontroller and Embedded Systems" using Assembly and C. Pearson 2nd Edition, 2011.
Chapter 1: 1.1-1.2, Chapter 2: 2.1-2.7, Chapter 3: 3.1-3.3, Chapter 4: 4.1-4.2, Chapter 5: 5.1-5.4, Chapter 6: 6.1-6.5, Chapter 7: 7.1-7.6, Chapter 8: 8.1, Chapter 9: 9.1-9.3, Chapter 10: 10.1-10.5, Chapter 11: 11.1-11.6, Chapter 17: 17.2-17.3

Reference Books:

1. Kenneth J. Ayala, "The 8051 Microcontroller Architecture, Programming and Applications", 2nd Edition, Penram International, 1996.
2. Dr. Uma Rao and Dr. Andhe Pallavi, "The 8051 Microcontroller Architecture, Programming and Applications", Pearson Education Sanguine.
3. V Udayshankar, M S Mallikarjunaswamy, " 8051 Microcontroller: Hardware, Software and Applications", McGrawHill, New Delhi.

Subject Title	:	**Object-Oriented Programming With Java**
Subject code	:	**UIS424C**
Semester	:	**4**
Credits with LTP Structure	:	**4 Credits (4L-0T-0P)**
Lecture Hours per Week	:	**4 Hours**
Tutorial Hours per Week	:	**0 Hours**
Total Contact Hours	:	**52 (52 Teaching Hours + 00 Tutorial Hours)**

Course Outcomes:

After completing the course the student will be able to:

1. Apprehend the fundamental concepts of object-oriented programming.
2. Implement basic Java programs and its features.
3. Develop programs using the concepts of classes and objects, constructors and method overloading.
4. Apply the concepts of inheritance, interfaces and packages.
5. Deploy standard applications using the principles of multithreading and exception handling mechanism.

UNIT - I	13 Hours	Teaching Hours	Tutorial Hours
Object-oriented Concepts **OOP Concepts**: Procedural Programming, Problems with procedural programming, Object-oriented programming, P.O.P v/s O.O.P, OOP features-Encapsulation, Inheritance, Polymorphism, etc., Benefits of OOP, Applications of OOP, Pure OOP languages-five rules, The 'Object' concept, ADT, Encapsulation and Information Hiding, Class v/s Object, Type and Interface, Instantiating classes, Interaction between objects, Association, Aggregation and Decomposition, Example, Generalization and Specialization, Example.		13	00

UNIT - II	13 Hours	Teaching Hours	Tutorial Hours
Evolution of Java: Java's lineage, Creation of Java, How Java changed the internet, Byte code, Features of Java. **An Overview of Java:** Features of Java, First simple program, Lexical Issues. **Data Types and Variables:** The Primitive Types, Literals, Variables, Type Conversion and Casting, Automatic Type Promotion. **Operators:** Arithmetic operator, Bitwise operators, Relational operators, Boolean Logical operators, Assignment operators, The '?' Operator, Operator precedence. **Control Statements:** Java's selection statements, Iteration statements, Jump statements. **Arrays:** One-dimensional arrays, Multi-dimensional arrays.		13	00

UNIT - III	13 Hours	Teaching Hours	Tutorial Hours
Classes, Inheritance and Interfaces **Introducing Classes:** Class fundamentals, Declaring Objects, Assigning object reference variables, Introducing methods, Constructors, The 'this' keyword. **Methods and Classes:** Overloading methods, Introducing Access control,		13	00

Understanding static, Introducing final.

Inheritance: Inheritance basics- Member access and inheritance, Using super, Multi-level inheritance, Method overriding; Dynamic method dispatch, abstract classes , using 'final' with inheritance.

Interfaces: Defining an interface, Implementing interfaces, Applying Interfaces.

UNIT - IV	13 Hours	Teaching Hours	Tutorial Hours
Packages, Exceptions and Threads **Packages:** Packages, Access protection, Importing packages. **Exception Handling:** Fundamentals, Exception types, Uncaught exceptions, Using try and catch, Multiple catch clauses, Nested try statements, throw, throws, Java's built-in exceptions. **Multithreaded programming:** The Java Thread model, The Main thread, Creating a thread, Creating multiple threads, Thread priorities, Synchronization, Interthread communication, Suspending, Resuming and Stopping threads.		13	00
Text Books:			
1. The Complete Reference -Java, Herbert Schildt, 7th edition, McGraw Hill Publication.			
Reference Books:			

Subject Title	:	Operating System
Subject code	:	UIS415C
Semester	:	4
Credits with LTP Structure	:	3 Credits (3L-0T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	40 (40 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:
1. Comprehend the principles of operating system.
2. Select appropriate scheduling algorithm for efficient resource utilization.
3. Identify race conditions to avoid and resolve deadlocks.
4. Apply various memory management approaches for efficient utilization of memory.
5. Apply secured file accessing and disk scheduling algorithms.

UNIT - I	10 Hours	Teaching Hours	Tutorial Hours
OVERVIEW Introduction: What Operating Systems Do: User View, System View. , Operating-System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management, Protection and Security. System Structures: Operating-System Services, User Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure		10	00

UNIT - II	10 Hours	Teaching Hours	Tutorial Hours
PROCESS MANAGEMENT Process Concept: Operations on Processes. Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, MultipleProcessor Scheduling. Multi-Threaded Programming: Overview, Multithreading Models, Thread Libraries, Threading Issues. Process Scheduling: Thread Scheduling.		10	00

UNIT - III	10 Hours	Teaching Hours	Tutorial Hours
PROCESS COORDINATION Synchronization: The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Monitors Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Detection, Recovery from Deadlock. MEMORY MANAGEMENT Memory Management Strategies: Background, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation.		10	00

UNIT - IV	10 Hours	Teaching Hours	Tutorial Hours
MEMORY MANAGEMENT **Virtual Memory Management:** Background, Demand Paging, Page Replacement STORAGE MANAGEMENT File system: File concept, Access Methods, Directory Structure Implementing File Systems: File-System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free-Space Management. Secondary Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap-Space Management.		10	00

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "OPERATING SYSTEM PRINCIPLES", 7th Edition, [Chapters or Topics: 1.1, 1.4–1.9, 2.1–2.7, 3.1–3.3, 4.1– 4.4, 5.1–5.5, 6.1–6.5,6.7, 7.1-7.4, 7.6,7.7,8.1–8.6, 9.1, 9.2, 9.4, 10.1-10.3, 11.1–11.5, 12.1–12.6], Wiley–India, 2006.

Reference Books:

1. D. M. Dhamdhere, "Operating systems - A concept based Approach", 2nd Edition, Tata McGraw-Hill, 2002.
2. P. C. P. Bhatt, "Operating Systems", 2nd Edition, PHI, 2006.
3. Harvey M. Deital, "Operating systems", 3rd Edition, Addison Wesley, 1990.

Subject Title	:	**Analysis And Design Of Algorithms**
Subject code	:	**UIS403C**
Semester	:	**4**
Credits with LTP Structure	:	**4 Credits (3L-1T-0P)**
Lecture Hours per Week	:	**3 Hours**
Tutorial Hours per Week	:	**2 Hours**
Total Contact Hours	:	**66 (40 Teaching Hours + 26 Tutorial Hours)**

Course Outcomes:

After completing the course the student will be able to:
1. Comprehend fundamentals of various algorithm design techniques.
2. Apply various algorithms to solve engineering problems.
3. Design appropriate algorithms to solve open-ended problems.
4. Apply mathematical preliminaries to analyze algorithms.
5. Analyze time complexity of different types of algorithms.
6. Analyse limitations of various algorithm.

UNIT - I	16 Hours	Teaching Hours	Tutorial Hours
Introduction: What is an Algorithm?, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental Data Structures. **Fundamentals of the Analysis of Algorithm Efficiency**: Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Nonrecursive Algorithms, Mathematical Analysis of Recursive Algorithms, Example: Fibonacci Numbers.		10	06

UNIT - II	16 Hours	Teaching Hours	Tutorial Hours
Brute Force: Selection Sort and Bubble Sort, Sequential Search and Brute-Force String Matching, Exhaustive Search. **Divide-and-Conquer**: Mergesort, Quicksort, Binary Search, Binary Tree Traversals and Related Properties, Multiplication of Large Integers and Stressen's Matrix Multiplication. **Decrease-and-Conquer**: Insertion Sort, Depth-First Search and Breadth-First Search, Topological Sorting, Decrease-by-a-Constant-Factor Algorithms, Variable-Size-Decrease Algorithms.		10	06

UNIT - III	17 Hours	Teaching Hours	Tutorial Hours
Transform-and-Conquer: Presorting, Balanced Search Trees, Heaps and Heapsort, Problem Reduction. **Space and Time Tradeoffs**: Sorting by Counting, Input Enhancement in String Matching, Hashing, B-trees. **Dynamic Programming**: Computing a Binomial Coefficient, Warshall's and Floyd's Algorithms, The Knapsack Problem and Memory Functions.		10	07

UNIT - IV	17 Hours	Teaching Hours	Tutorial Hours
Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's		10	07

Algorithm, Huffman Trees.		
Limitation of Algorithm Power: Lower-Bound Arguments, Decision Trees. **Coping with the Limitations of Algorithm Power:** Backtracking, Branch-and-Bound.		

Text Books:

1. Anany Levitin, "Introduction to the Design & Analysis of Algorithms", 2nd Edition, [Chapters or Topics: 1, 2.1–2.5, 3.1, 3.2, 3.4, 4.1–4.5, 5.1–5.3, 5.5, 5.6, 6.1, 6.3, 6.4, 6.6, 7, 8.1, 8.2, 8.4, 9, 11.1–11.3, 12.1–12.2], Pearson Education, 2007.

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, "Introduction to Algorithms", 2nd Edition, PHI, 2006.
2. Horowitz E., Sahni S., Rajasekaran S. "Computer Algorithms", Galgotia Publications, 2001.

Subject Title	:	Bridge Course Mathematics-II
Subject code	:	UMA430M
Semester	:	4
Credits with LTP Structure	:	Mandatory
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	00
Total Contact Hours	:	40 (40 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:

1. Explain various physical models through first and higher order differential equations and solve such linear ordinary differential equations.
2. Apply the Laplace transform techniques to solve differential equations.
3. Understand the concepts of Linear and Bernoulli's equation.
4. Understand a variety of partial differential equations and solution by exact methods.
5. solve PDE by direct integration and Solution of Lagrange's linear PDE, method of separation of Variables

UNIT - I	20 Hours	Teaching Hours	Tutorial Hours
Ordinary differential equations of first order: Variable seperable,Homogeneous.Exact form and reducible to exact differential equations.Linear and Bernoulli's equation. **Differential Equations of higher order:** Second and higher order linear ODE's with constant coefficients-Inverse differential operator, method of variation of parameters(second order); Cauchy's and Legendre homogeneous equations.		20	00

UNIT - II	20 Hours	Teaching Hours	Tutorial Hours
Laplace Transform: 20 Hours Introduction, Definition of Laplace Transform, Laplace Transform of Elementary functions, Properties: Shifting, differentiation, Integral and division by t. Periodic function, Heaviside's Unit step function **Inverse Laplace transforms** – Properties. Convolution theorem. Solutions of linear differential equations		20	00

Text Books:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016.

Reference Books:

1. Thomas' Calculus: Early Transcendentals, Single Variable (13th Edition)
2. **Calculus:**Early Transcendentals James Stewart
3. C.Ray Wylie, Louis C.Barrett : "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Book Co., New York, 1995.
4. B.V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
5. Veerarajan T.," Engineering Mathematics for First year", Tata McGraw-Hill, 2008.
6. N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.

Subject Title	:	**Constitution of India**
Subject code	:	**UHS226M**
Semester	:	**4**
Credits with LTP Structure	:	**Mandatory**
Lecture Hours per Week	:	**2 Hours**
Tutorial Hours per Week	:	**0 Hours**
Total Contact Hours	:	**26 (26 Teaching Hours + 00 Tutorial Hours)**

Course Outcomes:

After completing the course the student will be able to:

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

UNIT - I	**07 Hours**	**Teaching Hours**	**Tutorial Hours**
Introduction to Constitution: Meaning and importance of the Constitution, salient features of Indian Constitution. Preamble of the Constitution. Fundamental rights- meaning and limitations. Directive principles of state policy and Fundamental duties -their enforcement and their relevance.		**07**	**00**

UNIT - II	**06 Hours**	**Teaching Hours**	**Tutorial Hours**
Union Government: Union Executive- President, Vice-president, Prime Minister, Council of Ministers. Union Legislature- Parliament and Parliamentary proceedings. Union Judiciary-Supreme Court of India – composition and powers and functions.		**06**	**00**

UNIT - III	**07 Hours**	**Teaching Hours**	**Tutorial Hours**
State and Local Governments: State Executive- Governor, Chief Minister, Council of Ministers. State Legislature-State Legislative Assembly and State Legislative Council. State Judiciary-High court. Local Government-Panchayat raj system with special reference to 73rd and Urban Local Self Govt. with special reference to74th Amendment.		**07**	**00**

UNIT - IV	**06 Hours**	**Teaching Hours**	**Tutorial Hours**
Election provisions, Emergency provisions, Amendment of the constitution: Election Commission of India-composition, powers and functions and electoral process. Types of emergency-grounds, procedure, duration and effects. Amendment of the constitution- meaning, procedure andlimitations.		**06**	**00**

Text Books:

1. M.V.Pylee, "Introduction to the Constitution of India",4th edition, Vikaspublication,2005.
2. Durga Das Basu(D. D. Basu), "Introduction to theconstitutionofIndia",(Student Edition),19th edition,Prentice-Hall EEE,2008.

Reference Books:

1. Merunandan, "Multiple Choice Questions on Constitution of India", 2nd edition,Meraga publication,2007.

Subject Title	:	Samskrutika Kannada
Subject code	:	UHS488C
Semester	:	4
Credits with LTP Structure	:	1 Credits (2L-0T-0P)
Lecture Hours per Week	:	2 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	26 (26 Teaching Hours + 00 Tutorial Hours)

PÉÆÃ¸ïð ¥sÀ°vÁÁ±ÀUÀ¼ÀÄ:

After completing the course the student will be able to:

2. «zÁåyðUÀ¼ÀÄ ¨Ë¢ÞPÀªÁV ¨É¼ÉÀiÀÄÄªÀÅzÀgÉÆ¢UÉ £ÀªÀÄä £Ár£À ªÀÄÄvÀÄÛzÉÃ±ÀzÀ ¸ÀA¸ÀÌøwPÀ ªÁgÀ¸ÀÄzÁgÀgÁV ¨É¼ÉzÀÄ ¸Áeª̂À®A©AiÀiÁV §zÀÄPÀÄ PÀnÖPÉÆ¼À¼ÀîvÁÛgÉ.

3. PÀ£ÀßqÀ ¨sÁµÉAiÀÄ£ÀÄß ¸ÀªÀÄxÀðªÁV ªÀÄÄvÀÄ£ÀÁqÀÀ̂ÀÀåzÀ¤gÉÆÀ¢UÉ, C£ÀågÀ£ÀÄß CxÉÊð¹PÉÆ¼À¼Àîî̂À ªÀÄ£ÉÆÀ§® ¨É¼É¹PÉÆ¼À¼ÀîvÁÛ¼É. EªÀwÛ̂À ¸ÀAQÃtð́ÁzÀ ¸Á̂ÀÂÀiÁfPÀ ªÀå̂À̧ÉÜAiÀÄÀ°è ¸Ë°zÀðAiÀiÀÄÄ̂ÀvÀ°ªÁzÀ £ÀqÀÄÄ̂Àî̂PÉAiÀÉÆ¢UÉ ¸ÀA¥À£À¼ä® ªÀåQÛAiÀiÁV gÀÆ¥ÀÀÄUÉÆ¼À¼ÀîvÁÛ¼É.

4. eÁUÀwPÀgÀtzÀEªÀÀwÛ̂À ¸ÀAzÀ¨sÀðzÀ°è «zÁåyðUÀ¼ÀÄ ¸ÀévÀAvÀæö̂ÁVD¯ÉÆÃ¸ÀÄÀ̂ÀÄ, ¸ÀévÀAvÀæ̂ÁV §gÉAiÀÄÄ̂ÀÄ, ¸ÀévÀAvÀæ̂ÁV aAvÀ£À²Ã®gÁUÀ̂ÀÄ ¸ÀÀ̂ÀÄxÀååð£À̂ÄÀß ¥ÀqÉzÀÄ, ¸ÀÀ̂ÀÄAiÉÆÃaªÀ̂ÁV ¸ÀÆPÀÛ ¤zsÁðgÀUÀ¼À£ÀÄß PÉÊUÉÆ¼À¼Àî̂À°è F CzsÀåAiÀÄ£À ¢Ã¥À ¸ÀÜÂÀVzÉ.

5. «zÁåyðUÀ¼ÀÄ EA¢£À eÀ̂ÄÀwPÀ «zÀåªÀ̂AiÀÁ£À̂AiÀÁ£ß̂À CxÉÊð¹PÉÆAqÀÄ, ¸ÀÀ̂ÀÄÃzzÀ°è ¸ÀAWÀf«AiÀÄ̂ÄÀV ¨É¼ÉAiÀÄÄ̂ÀÄ ªÀÄ£ÀÄ£É̂Ã§®̂ÀÀ̂ÄÀß ̂ÀÄ̂ÄÀ̂À̂ÄUwÄ̂ÄvÉÀ̂ÀÄÀ̂ÀvÁÀ°è F CzsÀåAiÀÄ£À ¸ÀÆPÀÛ̂ÁzÀ ªÀ̂ÀÄUÀðzÀ²̂ðPÀAiÀiÁVzÉ.

6. vÀ̂À C¹ävÉAiÀÄ °ÀÀqÀ̂ÀÄPÁ̂ÀlzÀ°è̂ÀgÀ̂À ªÀåQÛÛÉ, Czå F £É®zÀ ¸Á©ü̂ÀiÁ£À̂Àï̂À, ¨ŝÀ̂ÈÀÈ̂É, ¦̂À̂ÄÂw, ¸ÉÃzÀ̂À̂AiÀÄÀ̂À̂ÀÁzÀ ªÀ̂À£À ̂À̂ÄìUÀ¼À°è EzÉJA§ÄẑÀ£ÀÄß «zÁåyðUÀ¼À CjÀÀ̂ÉÀ̂ÀĝÀ̂ÀÀ̂ÀẑÉ.

7. «zÁåyð̂À ¥À̂ÀĵÀÄgÀ ¥À̂ÀæÃÕ̂ÄÀ̂ÀÄ£̂À̂Àß eÀÀ̂À̂ÈvâÀÀÉÆ½¹¹̂À, zÉ̂Ê̂Àï̂À̂¶ÀÄÀiÁ̂ÀẑÀ F ĈÄÀ̂Æ̂Àå ̂À̂À̂Äv̂À̂Àۢ̂À̂Àß »̂À̂À-«v̂À̂À̂ÀÁ̂ÀV §¼À¹PÉÆ̂ÀqÀÄ ̂À̂À̂Àn̂À̂̂Àv̂À̂À̂½̂ÀAiÀ̂̂ÄÀÀV ©̂ÀÄÀ̂Æ̂Ã̂ÉÆ̂ÀÀÀ̂À̂À̂°è̂ÀeÀ̂À̂È̂À̂À£̂À̂À£̂ÀÁ̂À̂À̂Àv̂̂ÂÁ̂ÀÛ̂É.

¨sÁUÀ - I	06 Hours	Teaching Hours	Tutorial Hours
PÀ£ÀßqÀ £ÁqÀÄ, £ÀÄr, ¸ÀA¸ÀÌøw ªÀÄvÀÄÛ ªÀåQÛavÀæt 1. PÀ£ÁðlPÀ ¸ÀA¸ÀÌøw - °ÀÀ̂À¥À £ÁUÀÃdAiÀÄå 2. PÀ£ÁðlPÀKQÃPÀgÀt:MAzÀ̂ÄC¥À̂ÀÆ̂ÀÀ̂ÀðZÀjvÉ–f.̂ÉAPÀl̂ÀÀ̂À§âAiÀÄÀå 3. PÀ£ÀßqÀ ¨sÁµÉ ªÀÄvÀÄÛPÀ£ÁðlPÀ ¸ÀÂÀÌøw–«vÁ« 4. qÁ. ¸ÀgÍ. JA. «±É̂Ã±À̂ÀÃgÀAiÀÄÀå: ªÀåQÛ ªÀÄvÀÄÛÀLŵÀ̂Àå–	**06**	**00**

J.J£ï.ªÀÄÆwðgÁªï			
¨sÁUÀ - II	**06 Hours**	**Teaching Hours**	**Tutorial Hours**
PÀxÉ, ¥Àæª Á¸ ÀPÀxÉ ªÀ ÄvÀÄ ÛPÀgÀPÀ Ä±À ® PÀ¯É 1. AiÀ ÄÄUÁ¢ - ª À¸ ÀÄzsÉÃAz Àæ 2. ªÉ ÄUÁ£ É JA§ Vjd £À ¥À ªÀ ðvÀ - ». a. ¨É ÆÃg À°AUÀ AiÀ Äå 3. PÀg ÀPÀ Ä±À® PÀ ¯ÉUÀ¼ À ª ÀÄv ÀÄ Û ¥ÀgÀ A¥Àg ÉAiÀ Ä «eÁÕ£ À–P ÀjU Ëq À ©ÃZ À£ À°À½	**06**	**00**	
¨sÁUÀ - III	**07 Hours**	**Teaching Hours**	**Tutorial Hours**
PÁªÀ å 1. ªÀ ZÀ£ ÀUÀ¼ À - §¸ À ªÀ ÄtÚ, C®èª ÀÄ¥Àæ ¨ sÀÄ, CPÀ Ìª Àĺ ÁzÉ« 2. Q Ãv À ð£ÉU À¼ À - ¥À ÄgÀ Az ÀgÀz Á¸ Àg ÀÄ, PÀ£ ÀPÀzÁ¸ Àg ÀÄ 3. v ÀvÀ é¥ ÀzÀU À¼ À - ²± À Ä£ Á¼ À ± Àj Ã¥ sÀg ÀÄ, ¨ Á®°Ã¯ Á ª ÀÄº ÁAv À ²ªAiÉÆÃUÀ¼ À 4. d£ À¥ ÀzÀ VÃv É, 5. ªÀ ÄPÀ Ä ªÀ Äå ä£ À PÀUÀ Î –r«f 6. ¨É ¼ÀUÀ Ä - CA©PÁv À£ ÀAi À ÄzÀvÀ Û, 7.C¤ PÉ Ãv À£ À - PÀ ÄªÉ ¥À¥ À	**07**	**00**	
¨sÁUÀ - IV	**07 Hours**	**Teaching Hours**	**Tutorial Hours**
PÁªÀ å, «eÁÕ£ À ªÀ ÄvÀÄ ÛvÀAvÀæeÁÕ£ À **PÁªÀ å** 1. ºÉ AqÀwA iÀ ÄPÁUÀz À - P É.J ¸ ï.£ ÀgÀ¹ ÀAº À¸ Áé«Ä 2. ªÀ ÄÄ¨ ÉÊ eÁ vÀPÀ –f.J ¸ ï.²ª ÀgÀÄzÀæ ¥ Àà 3. D ª ÀÄg À F ª À Äg À–ZÀ AzÀ æ±ÉÃR ÀPÀ A¨ÁgÀ 4. ZÉ Ã ª À À£ À ª À ÄPÀ À̼ À ºÁq À - ¹ zÀÞ° AUÀ AiÀ Äå **«eÁÕ£ À ª À ÄvÀÄ ÛvÀAvÀæeÁÕ£ À** 1. 'PÀ' ª À ÄvÀÄ Û'§' §gÀ °À vÀ AvÀ æ±ÀU À¼ À, PÀ A iÀ ÄÆ lgï ª À ÄÄS ÁAv À g À½À§q Àz ÀmÉÊ AUï 2. PÀ £Àßq ÀPÀ A iÀ ÄÆ lgï ± À§ÞPÉ Æ ± À, 3. vÁ Aw æP À¥ À zÀ PÉ Æ ± À	**07**	**00**	
¥Ào Àå¥ÀÄ ¸ ÀÛPÀ:			
1. ¸ Á ¸ ÀÌðwP À PÀ£ ÀßqÀ (¸ ÀA), qÁ.».a.¨É ÆÃg À°AiÀ ÄAi À Äå, qÁ.J¯ï.w.w.ªªÉ ÄäÃ±À À±, ¥É Ææ.«.PÉ Ã±À À ªÀ ÄÆwð, Prasaranga VTU, Belagavi, Karnataka, 2020.			
Reference Books:			

Subject Title	:	Balake Kannada
Subject code	:	UHS489C
Semester	:	4
Credits with LTP Structure	:	1 Credits (2L-0T-0P)
Lecture Hours per Week	:	2 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	26 (26 Teaching Hours + 00 Tutorial Hours)

PÉÆÃ¸ïð ¥sÀ°vÁA±ÀUÀ¼ÀÄ:

After completing the course the student will be able to:

1. «zÁåyðUÀ¼ÀÄ PÀ£ÀßqÀ ¨sÁµÉAiÀÄ£ÀÄß ¸ÀÄ®¨sÀªÁV CxÉÊ&ð¹PÉÆAqÀÄ, ¸ÁªÀiÁfPÀªÁV, DyðPÀªÁV DAiÀiÁ ¥ÀæzÉÃ±ÀzÀ d£ÀgÉÆA¢UÉ C£ÉÆêÃ£ÀvÀ&ÁV ªÀå&ÀºÀj¸À¨ÉÃPÉ.

2. F ¥ÀoÁåzsÀåiÀÄ£À¢AzÀ «zÁåyðAiÀÄÄ DAiÀiÁ ¥ÀæzÉÃ±ÀUÀ¼À £ÀA©PÉ, ¸ÀA¥ÀæzÁAiÀÄ ªÀÄvÀÄÛ DZÀgÀuÉUÀ¼À£ÀÄß ¸ÀÄ®¨sÀªÁV CxÀð&ÀiÁrPÉÆ¼Àî®Ä ¸ÁzsÀåªÁUÀÄvÀÛzÉ.

3. PÀ£ÀßqÀ ¸ÀASÉåUÀ¼À ¥ÀjPÀ®à£É¬ÄAzÀ «zÁåyÀiÀÄÄ ªÀátÂdå ªÀå&ÀºÁgÀUÀ¼À£ÀÄß ¸ÀÄ®¨sÀªÁV £ÉgÉªÉÃj¸À®Ä ¸ÁzsÀåªÁUÀÄvÀÛzÉ.

4. ºÀÄvÀÄÛ&ÀªÁV «zÁåyÀiÀÄÄ PÀ£ÀßqÀ ¨sÁµÉAiÀÄ°è §gÀªÀtÂUÉAiÀÄ PÀ¯ÉAiÀÄ£ÀÄß ªÀÄvÀÄÛ NzÀÄ&À PÀ¯ÉAiÀÄ£ÀÄß ¨É¼É¹PÉÆ¼Àî&ÁÛ£É.

5. PÀ£ÀßqÀ ¨sÁµÉAiÀÄ ¤gÀAvÀgÀ ¸ÀA¥ÀPÀð¢AzÀ «zÁåyÀiÀÄÄ ¸ÀéAvÀ&Àæ&ÀiÁV D¯ÉÆÃa¸ÀÄ&À ªÀÄvÀÄÛ C©üªÀåQÛ¸ÀÄ&À ¸ÁªÀÄxÀåð&À£ÀÄß ¨É¼É¹PÉÆ¼Àî&ÁÛ£É.

6. F ¨sÁµÉAiÀÄ ¸ÀA¥ÀPÀð¢AzÁV «zÁåyÀiÀÄÄ PÀ£ÀßqÀ ¸Á»vÀå ¥ÀæPÁgÀUÀ¼Ázà PÀvÉ, PÀªÀ£À, PÁzÀA§j, £ÁlPÀ ªÀÄÄAvÁzÀ PÉëÃvÀæUÀ¼À°è vÀ£Àß C©ügÀÄaAiÀÄ£ÀÄß ºÉaѹPÉÆ¼Àî&ÁÛ£É.

UNIT - I	06 Hours	Teaching Hours	Tutorial Hours
Listening and Hearing **Introduction: Activity -I** - Easy learning of a Kannada Language: A few tips. - Necessity of learning a local language.		06	00

- Tips to learn the language with easy methods.
- Hints for correct and polite conservation.
- About Kannada Language (Kannada Bhashe).
- Eight Kannada authors who have won 'Jnanpith Award'.
- Information about Karnataka State.

KelisikolluvudumattuAlisuvudu: Activity -II

Listening to Kannada words and Sentences through different types of communications of day to day affairs. [Conversations in Kannada – Kannada BhasheyalliSambhashanegalu]

Conversation with
- With Friends – Snehitharodane-(¸ÉßÃ»vÀgÉÆqÀ£É)
- With Teachers-(UÀÄgÀÄUÀ¼ÉÆqÀ£É)
- In Shop, Market, Bus and Train(CAUÀr, ªÀiÁgÀÄPÀmÉÖ, §¸ï, gÉÊ®Ä)
- In Hotel / Canteen(ºÉÆmÉ¯ï/PÁåAnÃ¯ï£°è)
- With Dependents**(**CªÀ®A©vÀgÉÆqÀ£É)
- In Hostel with Friends, Warden, Cooks and Security(ºÁ¸ÉÖ¯ï£°è)
- Vocabulary - Shabdakosha–±À§ÝPÉÆÃ±À
- Conversation - Sambhashane-¸ÀA¨sÁµÀuÉ- 1 (about City)
- Conversation - Sambhashane-¸ÀA¨sÁµÀuÉ-2(between Friends)
- Exercises to test their knowledge of understanding the Language.

Conversation with Teacher, House Owner and Roommate
- Vocabulary - Shabdakosha –±À§ÝPÉÆÃ±À
- Conversation - Sambhashane-¸ÀA¨sÁµÀuÉ- 1 (with Teacher)
- Conversation-Sambhashane-¸ÀA¨sÁµÀuÉ-2(With House Owner)
- Conversation-Sambhashane-¸ÀA¨sÁµÀuÉ- 3 (with Roommate)
- Exercises to test their knowledge of understanding the Kannada Wards and Sentences in Conversation

Activity - III - Conversation with
- Vocabulary - Shabdakosha –±À§ÝPÉÆÃ±À
- Conversation - Sambhashane-¸ÀA¨sÁµÀuÉ-1 (with Teacher)
- Conversation-Sambhashane-¸ÀA¨sÁµÀuÉ-2 (with House Owner)
- Conversation-Sambhashane-¸ÀA¨sÁµÀuÉ-3 (with Roommate)
- Exercises to test their knowledge of understanding the Kannada Wards and Sentences in Conversation.

Activity - IV - Conversation with
- Vocabulary - Shabdakosha –±À§ÝPÉÆÃ±À
- Conversation - Sambhashane-¸ÀA¨sÁµÀuÉ-1 (with Teacher)
- Conversation-Sambhashane-¸ÀA¨sÁµÀuÉ-2 (with House Owner)
- Conversation-Sambhashane-¸ÀA¨sÁµÀuÉ-3 (with Roommate)

Excersises to test their knowledge of understanding the Kannada Wards and Sentences in Conversation.

UNIT - II	06 Hours	Teaching Hours	Tutorial Hours
Speaking and Asking **Maatanaaduvudu mattu Keluvudu** – □□□□□□□□□□□ □□□□□ □□□□□□□□ [Kannada Words and Sentences in Conversation - Sambhashaneyalli Kannadada Padagalu mattu Vakyagalu - ¸ÀA¨sÁµÀuÉAiÀÄ°è PÀ£ÀßqÀzÀ ¥ÀzÀUÀ¼ÀÄ ªÀÄvÀÄÛ ªÁPÀåUÀ¼ÀÄ] **In Speaking / Asking -Sambhashaneyalli-** ¸ÀA¨sÁµÀuÉAiÀÄ°è - Nouns - Naamapadagalu- £Áª ÀÄ¥ÀzÀUÀ¼ÀÄ - Pronouns – Sarvanamapadagalu- ¸Àªð£Áª ÀÄ¥ÀzÀUÀ¼ÀÄ - Adjectives – namavisheshanagalu - £Áª ÀÄ «±ÉÃµÀtUÀ¼ÀÄ - Verbs- Kriyapadagalu- QæAiÀiÁ¥ÀzÀUÀ¼ÀÄ - Adverbs - kriya visheshanagalu–QæAiÀiÁ «±ÉÃµÀtUÀ¼ÀÄ - Conjunctions - Samyogagalu–¸ÀAAiÉÆÃUÀUÀ¼ÀÄ - Prepositions - Upasarga– G¥À¸ÀUÀðUÀ¼ÀÄ - Interrogative words and Sentences in Conversation – Sambhashaneyalli Prashnarthaka padagalu mattu vakyagalu-¥Àæ±ÁßxÀðPÀ ¥ÀzÀUÀ¼ÀÄ ªÀÄvÀÄÛ ªÁPÀåUÀ¼ÀÄ - Vicharaneya/ Vicharisuva / Bedikeyavakyagalu (Enquiry / Request sentences in Conversation) - «ZÁgÀuÉAiÀÄ / «ZÁj¸ÀĪÀ / ¨ÉÃrPÉAiÀÄ ªÁPÀåUÀ¼ÀÄ Excersises to test their knowledge of understanding the Kannada Wards and Sentenses in Conversation.		**06**	**00**
UNIT - III	07 Hours	Teaching Hours	Tutorial Hours
Reading – Ooduvudu –NzÀÄªÀÅzÀÄ Kannada Words and Sentenses in General Reading and Conversation- Samanya Sambhashaneyalli Kannadada Padagalu mattu Vakyagalu - ¸ÀA¨sÁµÀuÉAiÀÄ°èPÀ£ÀßqÀzÀ ¥ÀzÀUÀ¼ÀÄ ªÀÄvÀÄÛ ªÁPÀåUÀ¼ÀÄ) - Singular and Plural nouns in Conversation- Sambhashaneyalli Ekaavachana mattu Bhahuvachana - JPÀªÀZÀ£À ªÀÄvÀÄÛ §°ÄªÀZÀ£À - Gender in Conversation - Sambhashaneyalli Linga- °AUÀ - Viruddha padagalu /Virodarthaka padagalu (Antonyms)– «gÀÄzÀÝ / «gÉÆÃzÁxÀðPÀ ¥ÀzÀUÀ¼ÀÄ. - Asamanjasa Uchcharane (Inappropriate Pronunciation) – C¸ÀªÀÄAd¸ÀGZÁÑgÀuÉ - SankhyaVyavasthe (Numbers system)- ¸ÀASÁå ªÀåªÀ¸ÉÜ - Bhinnamshagalu (Fractions) –©ü£ÁßA±ÀUÀ¼ÀÄ - Tindiya Hesarugalu/ Belagina upaharagala Hesarugalu - Menu (Names)		**07**	**00**

of the breakfast Items –wArAiÀÄ ºÉ¸ÀgÀÄÄÀ¼ÀÄ

- Aaharakke sambandhisida padagalu / Aaharapadarthagala Hesarugalu– (Names connected with food) –DºÁgÀPÉÌ ¸ÀA§A¢¹zÀ ¥ÀzÀUÀ¼ÀÄ.
- Samaya / Kalakke Sambhandhisida padhagalu (Words Relating to Time)– ¸ÀªÀÄAiÀÄ / PÁ®PÉÌ ¸ÀA§A¢ü¹zÀAvÀºÀ ¥ÀzÀUÀ¼ÀÄ
- Dikkugalige sambhadisida padhagalu (Words Relating to Directions) – ¢QÌUÉ ¸ÀA§A¢ü¹zÀAvÀºÀ ¥ÀzÀUÀ¼ÀÄ
- Manavana Bhavanegalige sambandisida Padagalu (Words Relating to Human's feelings and Emotions) –ªÀiÁ£ÀªÀ£À ¨sÁªÀ£ÉUÀ½UÉ ¸ÀA§A¢ü¹zÀ ¥ÀzÀUÀ¼ÀÄ
- Manavana shareerada bhagagalu / Angagalu (Parts of the Human body)- ªÀiÁ£ÀªÀ£À ±ÀjÃgÀzÀ ¨sÁUÀUÀ¼ÀÄ / CAUÀUÀ¼ÀÄ
- Manava Sambhandhada / Sambhandhaakke sambhadisida padhagalu (Terms Relating to Human Relationship)-ªÀiÁ£ÀªÀ ¸ÀA§AzÀPÉÌ ¸ÀA§A¢ü¹zÀAvÀºÀ ¥ÀzÀUÀ¼ÀÄ
- Vaasada stalakke sambhandisidanthaha padhagalu (Words Relating to Place of Living) -ªÁ¸ÀzÀ ¸ÀÜ¼ÀPÉÌ ¸ÀA§A¢¹zÀAvÀºÀ ¥ÀzÀUÀ¼ÀÄ
- Saamanya Sambhashaneyalli Bhalasuvanthaha Padagala Patti (List of Words, used in the general conversation) – ¸ÁªÀiÁ£Àå ¸ÀA¨sÁµÀuÉAiÀÄ°è §¼À¸ÀĪÀAvÀºÀ ¥ÀzÀUÀ¼À ¥ÀnÖ

Additional Excersises to test their knowledge of understanding the Kannada words and sentences in their communication.

UNIT - IV	07 Hours	Teaching Hours	Tutorial Hours
Writing – Bareyuvudu – §gÉAiÀÄĪÀÅzÀÄ **Kannada Alphabets and their Pronunciation –** **Kannada AksharaMale mattu uchcharane –** **PÀ£ÀßqÀ CPÀëgÀªÀiÁ¯É ºÁUÀÆ GZÁÑgÀuÉ PÀ£ÀßqÀ CPÀëgÁ¸Àå** - Kannada Aksharamale(PÀ£ÀßqÀ CPÀëgÀªÀiÁ¯É) - Kannada stress letters - vattakshara (also often written as Ottakashara) - Kannada khaghunitha (Pronounced as ka-gunitha) - Excersises to test their knowledge of understanding the Kannada words. - Pronunciation (Uchcharane), Memorization and usage of the Kannada Letters		07	00

- VargeeyaVyanjanagalaUchcharane (Pronounciation of Structured Consonants) AvargeeyaVyanjanagalaUchcharane (Pronounciation of Unstructured Consonants) Excersises to test their knowledge of understanding the Kannada words.
- Excersises to test their knowledge of understanding the Kannada alphabets.

Additional Excersises to test their knowledge of understanding the Kannada alphabets.

¥ÀoÀå¥ÀÄ¸ÀÛPÀ:

1. §¼ÀPÉ PÀ£ÀßqÀ(¸ÀA), qÁ.J¯ï.WªÉÄäÃ±À, ¥ÉÆæ. «. PÉÃ±ÀªÀªÀÄÆwð, Prasarang, VTU, Belagavi, Karnataka 2020.

Reference Books:

Subject Title	:	**Universal Human Values-II**

Subject Title	:	**Universal Human Values-II**
Subject code	:	**UHS004M**
Semester	:	**4**
Credits with LTP Structure	:	**Mandatory (2L-1T-0P)**
Lecture Hours per Week	:	**2 Hours**
Tutorial Hours per Week	:	**2 Hours**
Total Contact Hours	:	**42 (28 Teaching Hours + 14 Tutorial Hours)**

Course Outcomes:

After completing the course the student will be able to:
1. To become more aware of holistic vision oflife - themselves and their surroundings.
2. To become more responsible in life, in the society and in handling problems with sustainable solutions.
3. To sensitive towards their commitment towards what they understood towards environment and socially responsible behaviour.
4. To able to apply what have learnt to their own self in different day-to-day settings in real life and in handling problems with sustainable solutions.
5. To develop competence and capabilities for maintaining Health andHygiene.
6. To adopt the value of appreciation and aspiration for excellence and gratitude for all.

UNIT - I	09 Hours	Teaching Hours	Tutorial Hours
Introduction to Value Education Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education),Understanding Value Education,**Tutorial 1: PracticeSession PS**1-Sharing aboutOneself,Self-exploration as the Process for Value Education,Continuous Happiness and Prosperity – the Basic Human Aspirations,**Tutorial 2: PracticeSessionPS**2-Exploring HumanConsciousness,Happiness and Prosperity – CurrentScenario,Method to Fulfill the Basic HumanAspirations, **Tutorial 3: Practice SessionPS**3-Exploring		06	03

Natural Acceptance *L-06hrs &T-03hrs*			

UNIT - II	12 Hours	Teaching Hours	Tutorial Hours
rmony in the Human Being and Harmony in the Family Understanding Human being as the Co-existence of the Self and the Body**,**Distinguishingbetween the Needs ofthe Self and the Body,**Tutorial 4: PracticeSessionPS**4Exploring the difference of Needs of Self andBody,The Body as an Instrument of the Self,Understanding Harmony in the Self,**Tutorial 5: PracticeSessionPS**5-Exploring Sources of Imagination in theSelf,Harmony of the Self with the Body,Programme to ensure self-regulation and Health,**Tutorial 6: PracticeSessionPS**6-Exploring Harmony of Self with theBody,Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship **Tutorial 7: PracticeSessionPS**7-Exploring the Feeling of Trust. **L-08hrs &T-04hrs**		08	04

UNIT - III	12 Hours	Teaching Hours	Tutorial Hours
Harmony in the Family, Society and Nature/Existence 'Respect' **–** as the RightEvaluation,**Practice Session PS***8-Exploring the Feeling of Respect*,OtherFeelings, Justice in Human-to-Human Relationship,Understanding Harmony in the Society,Vision for the Universal Human Order,**Tutorial 9: Practice Session PS***9-Exploring Systems to fulfil Human Goal*,Understanding Harmony in the Nature,Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature,**Tutorial 10: PracticeSessionPS***10-Exploring the Four Orders ofNature,*Realizing Existence as Co-existence at All Levels,The Holistic Perception of Harmony in Existence,**Tutorial 11: PracticeSessionPS***11-Exploring Co-existence inExistence* **L-08hrs&T-04hrs**		08	04

UNIT - IV	09 Hours	Teaching Hours	Tutorial Hours
Implications of the Holistic Understanding – a Look at Professional Ethics Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, **Tutorial 12: PracticeSessionPS***12-Exploring Ethical HumanConduct,* A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, **Tutorial 13: PracticeSessionPS***13-Exploring Humanistic Models inEducation,* Holistic Technologies, Production Systems and Management Models-Typical CaseStudies, Strategies for Transition towards Value-based Life and Profession, **Tutorial 14: PracticeSessionPS***14-Exploring Steps of Transition towards Universal Human Order* **L-06hrs &T-03hrs**		06	03

Text Books:

Reference 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'Manualfor*AFoundationCourseinHumanValuesandProfessionalEthics*,RRGaur,   R Asthana,G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-9387034-53-2
3. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak,1999.
4. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi,2004.
5. The Story of Stuff(Book).
6. The Story of My Experiments with Truth - by Mohandas KaramchandGandhi
7. Small is Beautiful - E. F Schumacher.
8. Slow is Beautiful – CecileAndrews

9. Economy of Permanence - J CKumarappa
10. Bharat Mein Angreji Raj – PanditSunderlal
11. Rediscovering India – byDharampal
12. Hind Swaraj or Indian Home Rule - by Mohandas K.Gandhi
13. India Wins Freedom - Maulana Abdul KalamAzad
14. Vivekananda - Romain Rolland(English)
15. Gandhi - Romain Rolland(English)

Subject Title	:	**Fundamentals of Quantitative Aptitude and Soft Skills**
Subject code	:	**UHS001N**
Semester	:	**4**
Credits with LTP Structure	:	**1 Credits (1L-0T-0P)**
Lecture Hours per Week	:	**1 Hours**
Tutorial Hours per Week	:	**0 Hours**
Total Contact Hours	:	**15 (15 Teaching Hours + 00 Tutorial Hours)**

Course Outcomes:

After completing the course the student will be able to:

1. Learned the importance of non-verbal communication.
2. Understood the various sounds in the English Language.
3. Enhanced his/her vocabulary and learnt techniques to augment it further.
4. Understood analysis of the given problem and learnt to develop a method for solving it.
5. Enhanced and augmented his/her ability to work with quantitative problems.

UNIT - I	04 Hours	Teaching Hours	Tutorial Hours
Communication Skills & Vocabulary Development: Communication Tools, Active Listening, Non Verbal Communication, Vocabulary Building Techniques, Root Words, Antonyms & Synonyms		**04**	**00**
UNIT - II	04 Hours	Teaching Hours	Tutorial Hours
Spoken English, English Language Structure & Number Theory: Introduction to IPA, Sounds in English, Grammar and Bouncing, Number System, Ratio-Proportion-Variation		**04**	**00**

UNIT - III	04 Hours	Teaching Hours	Tutorial Hours
Presentation Skills & Linear Equations: Corporate Presentation Basics, Drills, Captivating the Audience, The God of Math		04	00

UNIT - IV	03 Hours	Teaching Hours	Tutorial Hours
Factors and Multiples & Verbal and Visual Reasoning: HCF, LCM, Human Relations, Direction Tests, Coding Decoding, Clocks and Calendars, Visual Reasoning		03	00

Text Books:

Reference Books:

1. R. S. Aggarwal, "A Modern Approach to Verbal and Non – Verbal Reasoning", Sultan Chand and Sons, New Delhi, 2018

2. R. S. Aggarwal, "Quantitative Aptitude", Sultan Chand and Sons, New Delhi, 2018

3. Chopra, "Verbal and Non – Verbal Reasoning", MacMillan India

4. M Tyra, "Magical Book on Quicker Maths", BSC Publications, 2018

5. Booher Diana, "Communicate With Confidence", Booher Research Institute, 2011

5th Semester 175 Credits

Subject Title	:	Web programming
Subject code	:	UIS513C
Semester	:	4
Credits with LTP Structure	:	3 Credits (3L-0T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	40 (40 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:

1. Develop web pages using technologies like XHTML, CSS and XML.
2. Develop JavaScript scripts for event handling.
3. Build dynamic documents using JavaScript and XHTML.
4. Implement web pages using PHP.
5. Develop web pages using Ruby language.

UNIT - I	10 Hours	Teaching Hours	Tutorial Hours
FUNDAMENTALS OF WEB, XHTML - Internet, HTTP request and HTTP response phase, MIME, The Web Programmers Toolbox. **XHTML:** Basic syntax; Standard XHTML document structure; Basic text markup. XHTML : Images; Hypertext Links; Lists; Tables; Forms; Frames; Syntactic differences between HTML and XHTML. CSS: Introduction; Levels of style sheets; Style specification formats; Selector forms; Property value forms; CSS: Font properties; List properties; Color; Alignment of text; Background	**10**	**00**

images; The <span> and <div> tags;			
UNIT - II	**10 Hours**	**Teaching Hours**	**Tutorial Hours**
Basics of JavaScript: General syntactic characteristics; Primitives, Screen output and keyboard input; Control statements; Object creation and modification, Arrays; Functions; Pattern matching using regular expressions. **JavaScript & XHTML Documents:** The Document Object Model, Element Access in JavaScript, Events & Event Handling, Basic Concepts of Event handling, Events, Attributes & Tags, Handling Events from Body Elements, Handling Events from Button Elements, Handling Events from Textbox & password Elements, The Focus Event, Validating from Input, The DOM 2 Event Model, Event Propagation, Event handler registration, An Example of the DOM 2 Event Model, The Navigator Object, DOM Tree Traversal and Modification, DOM Tree Traversal, DOM Tree Modification.		**10**	**00**
UNIT - III	**10 Hours**	**Teaching Hours**	**Tutorial Hours**
Dynamic Documents with JavaScript: Introduction, Positioning Elements, Absolute Positioning, Relative Positioning, Static Positioning, Moving Elements, Element Visibility, Changing Colors & Fonts, Changing Colors, Changing Fonts, Dynamic Contents, Stacking Elements, Locating the Mouse Cursor, Reacting to the Mouse Click, Slow Movement of Elements, Dragging & Dropping Elements. **Introduction to XML:** Introduction, The Syntax of XML, XML Document Structure, Document Type Definitions: Declaring Elements, Declaring Attributes, Declaring Entities, A Sample DTD, Internal & External DTDs, Namespaces, XML Schemas: Schemas Fundamentals, Defining the Schema, Defining the Schema Instances, An Overview of Data types, Simple Types, Complex Types, Displaying Raw XML Documents, Displaying XML Documents with CSS, Displaying XML documents with CSS; XSLT style sheets; XML processors;		**10**	**00**
UNIT - IV	**10 Hours**	**Teaching Hours**	**Tutorial Hours**
Introduction to PHP: Origins and Uses of PHP, Overview of PHP, General Syntactic Characteristics, Primitives, Operations and Expressions, Output, Control statements, Arrays, Functions, Pattern Matching, Form Handling, Files, Cookies, Session Tracking, Database access with PHP and MySQL. **Ruby :** Origins and uses of Ruby, Scalar types and their operations, Simple input and output, Control statements, Arrays, Hashes, Methods, Classes, Code blocks and iterators, Pattern matching.		**10**	**00**
Text Books:			
2. Programming the World Wide Web - Robert W. Sebesta, 4th Edition, Pearson Education, 2008.			
Reference Books:			
1. Internet & World Wide Web How to program - M. Deitel, P.J.Deitel, A. B. Goldberg, 3rd Edition, Pearson Education / PHI, 2004. 2. Web Programming Building Internet Applications - Chris Bates,3rd Edition, Wiley India, 2006. 3. The Web Warrior Guide to Web Programming - Xue Bai et al,Thomson, 2003. 4. M.Srinivasan: Web Technology Theory and Practice, Pearson Education, 2012. 5. Jeffrey.C.Jackson: Web Technologies-A Computer Science Perspective, Pearson Education, Eleventh Impression, 2012			

Subject Title	:	Software Engineering
Subject code	:	UIS510C
Semester	:	5
Credits with LTP Structure	:	3 Credits (3L-0T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	40 (40 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:

1. Comprehend the basic concepts of software engineering.
2. Compare various software development life cycle models and apply appropriate model for a real time complex software development problem.
3. Elicitate, analyse and document in a standard form the requirements of real time complex software.
4. Apply various methods of software designs, user interface designs and coding standards to produce a software design document for real time complex software.
5. Design and write test cases using various test generation methods (Black box and White box methods) to test and produce reliable software.
6. Estimate the cost and resources required to develop real time complex software using various costing and project management methods.

UNIT - I	10 Hours	Teaching Hours	Tutorial Hours
INTRODUCTION: Evolution- from an art form to an engineering discipline, software development projects, exploratory style of software development, emergence of software engineering, notable changes in software development practices, computer systems engineering.		10	00

SOFTWARE LIFE CYCLE MODELS: A few basic concepts, waterfall model and its extensions, rapid application development, agile development models, spiral model, a comparison of different life cycle models **REQUIREMENTS ANALYSIS AND SPECIFICATION:** Requirements gathering and analysis, software requirements specification (SRS).		
UNIT - II **10 Hours**	**Teaching Hours**	**Tutorial Hours**
SOFTWARE DESIGN: Overview of the design process, how to characterize a good software design, cohesion and coupling, layered arrangement of Modules, approaches to software design **FUNCTION-ORIENTED SOFTWARE DESIGN:** Overview of SA/SD methodology, structured analysis, developing the DFD model of the system, structured design, detailed design, design review **OBJECT MODELLING USING UML:** Basic Object-orientation concepts, Unified Modelling Language, UML diagrams, Use case model,, Class diagrams, Interaction diagrams, Activity diagram, State chart Diagram **USER INTERFACE DESIGN:** Characteristics of a good user interface, basic concepts, types of user interfaces	**10**	**00**
UNIT - III **10 Hours**	**Teaching Hours**	**Tutorial Hours**
CODING AND TESTING: Introduction to program testing, Coding, code review, software documentation, testing, unit testing, black – box testing, White – box testing, debugging, program analysis tools, integration testing, testing object-oriented programs, systems testing **SOFTWARE RELIABILITY AND QUALITY MANAGEMENT**: Software reliability, statistical testing, software quality, software quality management system, ISO 9000, SEI capability maturity model **COMPUTER AIDED SOFTWARE ENGINEERING: CASE and its scope, Case Environment, CASE support in software life cycle, other characteristics of CASE tools**	**10**	**00**
UNIT - IV **10 Hours**	**Teaching Hours**	**Tutorial Hours**
SOFTWARE PROJECT MANAGEMENT: software project management complexities, responsibilities of a software project manager, project planning, metrics for project size estimation, project estimation techniques, COCOMO – a heuristic estimation technique, Staffing level estimation, scheduling, organization and team structures, staffing, risk management, software configuration management **EMERGING TRENDS**: client- server software, client server architectures, CORBA, COM/DCOM, Service - oriented architecture (SOA), software as a service (SaaS),	**10**	**00**
Text Books:		
Fundamentals of software engineering, Rajib Mall, 4th edition, pHI		
Reference Books:		
1. Software Engineering, Ian Somerville, 7th edition, Pearson Education 2. "Software Engineering- A Practitioners Approach", Pressman R.S, MGH New Delhi. 3. "An integral approach to software Engineering", Jalote P, Narosa, New Delhi.		

Subject Title	:	Database Management Systems
Subject code	:	UIS503C
Semester	:	5
Credits with LTP Structure	:	4 Credits (3L-1T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	2 Hours
Total Contact Hours	:	66 (40 Teaching Hours + 26 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:

1. Comprehend fundamentals of database management systems.
2. Design an ER model to open-ended database problem.
3. Develop a relational database model from ER model.
4. Design normalized relations.
5. Write SQL queries to create ,access, modify/update the databases.
6. Comprehend basics of transaction processing concepts and various concurrency techniques.

UNIT - I	16 Hours	Teaching Hours	Tutorial Hours
INTRODUCTION: Introduction; An example; Characteristics of database approach; Advantages of using DBMS approach; when not to use a DBMS. Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems. **ENTITY-RELATIONSHIP MODEL:** 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		10	6

Structural constraints; Weak entity types; Refining the ER Design; ER Diagrams, Naming conventions and design issues; Relationship types of degree higher than two.

UNIT - II	16 Hours	Teaching Hours	Tutorial Hours
RELATIONAL MODEL AND RELATIONAL DATABASE CONSTRAINTS: Relational model concepts; Relational model constraints and Relational database schemas; Update operations, Transaction and dealing with constraint violations. **SQL:** data definition and data types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL queries. Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL. **PL/SQL:** PL/SQL Concepts, PL/SQL Language Fundamentals, SQL in PL/SQL, DML Statements in PL/SQL		10	6
UNIT - III	17 Hours	Teaching Hours	Tutorial Hours
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 Properties of relational decompositions; Algorithms for relational database Schema design; Multivalued dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form; Inclusion Dependencies; Other Dependencies and Normal forms.		10	7
UNIT - IV	17 Hours	Teaching Hours	Tutorial Hours
TRANSACTION MANAGEMENT: Introduction to transaction processing; Transaction & system concepts; Desirable properties of transactions; Characterizing schedules based on recoverability; Characterizing schedules based on serializability; Transaction support in SQL; CONCURRENCY **CONTROL:** Two-phase locking techniques for concurrency control; **CRASH RECOVERY:** Recovery concepts; Recovery techniques based on deferred update; recovery techniques based on immediate update; shadow paging; The ARIES recovery algorithm;		10	7

Text Books:

1. "Fundamentals of Database Systems", Remez Elmasri & Shamkant B. Navathe, 5 th Edition, Pearson Education;

Reference Books:

1. " Database Management Systems", Ramakrishanan Gehrke 3 rd edition, McGraw-Hill Higher Education;
2. "An Introduction to Data base systems"C. J. Date, , Addision Wesley, 4 th edition.

Subject Title	:	Theoretical foundations of computer science
Subject code	:	UIS514C
Semester	:	5
Credits with LTP Structure	:	3 Credits (3L-0T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	40 (40 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:

1. Demonstrate a fundamental knowledge of the core concepts in automata theory an dformal languages.
2. Prove the properties of languages, grammars and automata with formal mathematical methods.
3. Analyse the closure properties of regular and context-free languages.
4. Design finite automata, pushdown automata, Turing machines for solving language pattern recognition patterns.
5. Apply mathematical and formal techniques for solving problems.

UNIT - I	10 Hours	Teaching Hours	Tutorial Hours
Automata: Introduction to Finite Automata, The central concepts of Automata theory. Finite Automata: Deterministic Finite automata, Non-Deterministic Finite Automata. An application of Finite Automata, and Finite Automata with Epsilon-transitions, *Regular Expressions:* Regular expressions, Finite Automata and Regular Expressions, and Applications of Regular Expressions.		10	00

UNIT - II	10 Hours	Teaching Hours	Tutorial Hours

Properties of Regular Languages: Proving languages not to be regular languages, Closure properties of regular languages, Decision properties of regular languages, and Equivalence and Minimization of Automata. Context Free Grammars and Languages: Context Free Grammars, Parse trees, Applications of Context Free Grammars, Ambiguity in Grammars and Languages.			10	00
UNIT - III		10 Hours	Teaching Hours	Tutorial Hours
Pushdown Automata: Definition of the Pushdown Automaton, The languages of a PDA, Deterministic Pushdown Automata. Properties of Context-Free Languages: Normal forms for Context Free Grammars.			10	00
UNIT - IV		10 Hours	Teaching Hours	Tutorial Hours
Introduction To Turing Machine: The Turing Machine, Programming Techniques for Turing Machines, Extensions to the basic Turning Machines, Turing Machine and Computers.			10	00

Text Books:

1. John. E., Hopcroft, Rajeev. Motwani, Jeffrey. D., Ullman, "Introduction to Automata Theory, Languages and Computation", 3rd Edition, Pearson Education, 2007. (Chapters: 1.1, 1.5, 2.2 to 2.5, 3.1 to 3.3, 4, 5, 6.1, 6.2, 6.4, 7.1, 8.1 to 8.4, 8.6)

Reference Books:

1. Peter. Linz, "An Introduction to Formal Languages and Automata", Third Edition, Fifth printing.
2. John, E., Hopcroft, Jeffrey. D. Ullman, "Introduction to Automata Theory, Languages and Computation", Narosa Publication.
3. A. M., PadmaReddy, "Finite Automata and Formal Languages, Pearson Education,2012

Open Electives

Subject Title	:	Software Engineering
Subject code	:	UIS531N
Semester	:	5
Credits with LTP Structure	:	3 Credits (3L-0P-0T)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	40 (40 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:

1. Comprehend fundamental of Software Engineering.
2. Compare software development life cycle models and apply appropriate model to a small commercial project.
3. Elicitate, analyse, specify and document requirements using various methods.
4. Apply various project management techniques to estimate and staff for small project.
5. Design small software using various architectural and design models.
6. Develop peusdocode, algorithms, and test cases to verify and validate software.

UNIT - I		10 Hours	Teaching Hours	Tutorial Hours
Introduction to Software Engineering. **The Software Process:** Various Software Process models, their comparison, advantages and disadvantages.			10	0

UNIT - II	10 Hours	Teaching Hours	Tutorial Hours
Software Requirements Analysis and Specification: Format of SRS, Characteristics of SRS, Functional and Non Functional requirements, Requirements analysis using Data Flow and ER Diagrams. **Project Management:** Planning, effort estimation, scheduling and staffing.		10	0

UNIT - III	10 Hours	Teaching Hours	Tutorial Hours
Software Architecture: Various architectural views and styles, documenting architecture. **Software Design:** Design concepts, Coupling and Cohesion, Function and Object Oriented Design, various complexity metrics.		10	0

UNIT - IV	10 Hours	Teaching Hours	Tutorial Hours
Coding: Principles and guidelines of coding, incremental and evolving style of coding, Unit Testing, code inspection and review, metrics. **Testing:** Concepts, test plan, test cases design using Black Box and White Box methods, metrics.		10	0

Text Books:
1. Pankaj Jalote, A concise Introduction to Software Engineering, Springer-Verlog, 2008

Reference Books:
1. Roger Pressman, A practitioners Approach to Software Engneering, PHI.
2. Ian Somerville, Fundamentals of Software Engineering, Pearson Education, 10 ed.
3. Rajib Mall, Fundamentals of Software Engineering, PHI, 2009.

Subject Title	:	**Java Programming**
Subject Code	:	**UIS532N**
Semester	:	**6**
Credits with LTP Structure	:	**3 Credits (3L-0T-0P)**
Lecture Hours per Week	:	**3 Hours**
Tutorial Hours per Week	:	**0 Hours**
Total Contact Hours	:	**40 (40 Teaching Hours + 00 Tutorial Hours)**

Course Outcomes:
After completing the course the student will be able to:
1. Identify the fundamental features and applications of object oriented concepts.
2. Create the programs using basics of Java programming language.
3. Develop programs applying the concepts of classes and objects, constructors, method overloading.
4. Develop programs applying the concept of inheritance to develop programs.
5. Identify the fundamental concepts and applications of multithreading.

Unit –I	10 Hours	Teaching Hours	Tutorial Hours
Object-oriented Concepts **OOP Concepts**: Procedural Programming, Problems with procedural		10	00

programming, Object-oriented programming, P.O.P v/s O.O.P, OOP features-Encapsulation, Inheritance, Polymorphism, etc., Benefits of OOP, Applications of OOP, Pure OOP languages-five rules, The 'Object' concept, ADT, Encapsulation and Information Hiding, Class v/s Object, Type and Interface, Instantiating classes, Interaction between objects, Association, Aggregation and Decomposition, Example, Generalization and Specialization.

Unit –II	10 Hours	Teaching Hours	Tutorial Hours
Introduction to Java			
Evolution of Java: Java's lineage, Creation of Java, How Java changed the internet, Byte code, Features of Java. **An Overview of Java:** Features of Java, First simple program, Lexical Issues. **Data Types and Variables:** The Primitive Types, Literals, Variables, Type Conversion and Casting, Automatic Type Promotion. **Operators:** Arithmetic operator, Bitwise operators, Relational operators, Boolean Logical operators, Assignment operators, The '?' Operator, Operator precedence. **Control Statements:** Java's selection statements, Iteration statements, Jump statements.		10	00

Unit -III	10 Hours	Teaching Hours	Tutorial Hours
Arrays, Classes			
Arrays: One-dimensional arrays, Multi-dimensional arrays. **Introducing Classes:** Class fundamentals, Declaring Objects, Assigning object reference variables, Introducing methods, Constructors, The 'this' keyword. **Methods and Classes:** Overloading methods, Introducing Access control, Understanding static, Introducing final.		10	00

Unit-IV	10 Hours	Teaching Hours	Tutorial Hours
Inheritance and Threads			
Inheritance: Inheritance basics- Member access and inheritance, Using super, Multi-level inheritance, Method overriding; Dynamic method dispatch, abstract classes, using 'final' with inheritance. **Multithreaded programming:** The Java Thread model, The Main thread, Creating a thread, Creating multiple threads, Thread priorities, Synchronization, Interthread communication, Suspending, Resuming and Stopping threads.		10	00

Text Book(s):
1. The Complete Reference -Java, Herbert Schildt, 7th edition, McGraw Hill Publication.
2. Programming with Java – A primer, E. Balaguruswamy, 4th edition, McGraw Hill Publication.
Reference Books:
1. Java for programmers, Paul J. Deitel and Harvey M. Deitel, Pearson Eduation.
2. Introduction to Java programming, Y. Daniel Liang, 7th edition, Pearson   Education.

Professional Electives

Subject Title	:	Data Science using Python
Subject code	:	UIS047E
Semester	:	5
Credits with LTP Structure	:	3 Credits (3L-0T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	40 (40 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:
After completing the course the student will be able to:

1. Comprehend fundamental concepts of data science along with its relation with other disciplines and skills needed for it.

2. Apply computational thinking and data pre-processing techniques of data analysis.

3. Use data analytical techniques and tools necessary to generate useful information from datasets.

4. Solve linear regression problems using linear modelling and gradient descent approaches.

5. Apply supervised machine learning methods for classification and unsupervised machine learning

methods for clustering.			
6. Apply data collection and evaluation skills in data science and machine learning.			

UNIT - I	10 Hours	Teaching Hours	Tutorial Hours
Introduction: Data Science, Applications of data science, Data science related to other field, Relationship between data science and Information science, Computational thinking, Skills for data science, Tools for data science, Issues of Ethics, Bias, and Privacy in Data Science **Data:** Introduction, Data types: Structured Data, Unstructured Data, Challenges with Unstructured Data. Data Collections: Open Data, Social Media Data, Multimodal Data, Data Storage and Presentation.Data Pre-processing: Data Cleaning, Data Integration, Data Transformation, Data Reduction, Data Discretization.		**10**	**00**

UNIT - II	10 Hours	Teaching Hours	Tutorial Hours
Techniques: Introduction, Data Analysis and Data Analytics, Descriptive Analysis, Variables, frequency Distribution, Measures of Centrality, Dispersion of a Distribution, Diagnostic Analytics, Correlations, Predictive Analytics, Prescriptive Analytics, Exploratory Analysis, Mechanistic Analysis, Regression. **Tools for data science: Python:** Introduction, Getting Access to Python, Download and Install Python, Running Python through Console, Using Python through Integrated Development Environment (IDE), Basic Examples, Control Structures, Statistics Essentials, Importing Data, Plotting the Data, Correlation , Linear Regression, Multiple Linear Regression,		**10**	**00**

UNIT - III	10 Hours	Teaching Hours	Tutorial Hours
Machine Learning Introduction and Regression: Introduction, Machine Learning, Regression, Gradient Descent **Supervised Learning:** Introduction, Logistic Regression, Classification with kNN, Naïve Bayes **Tools for data science: Python:**Introduction to Machine Learning, Classification (Supervised Learning)		**10**	**00**

UNIT - IV	10 Hours	Teaching Hours	Tutorial Hours
Unsupervised learning: Introduction, Agglomerative Clustering, Introduction to Reinforcement Learning **Tools for data science: Python:** Clustering (Unsupervised Learning) **Data Collection, Experimentation, and Evaluation**: Introduction, Data Collection Methods: Surveys, Survey Question Types, Survey Audience, SurveyServices, Analyzing Survey Data , Pros and Cons of Surveys, Interviews and Focus Groups, Why Doan Interview? Why Focus Groups? Interview or Focus Group Procedure, Analyzing Interview Data ,Pros and Cons of Interviews and Focus Groups, Log and Diary Data, User Studies in Lab and Field,Picking Data Collection and Analysis Methods: Introduction to Quantitative Methods, Introduction toQualitative Methods , Mixed Method Studies, Evaluation: Comparing Models, Cross-Validation.		**10**	**00**

Text Books:

1. A hands-on introduction to Data Science, Chirag Shah, Cambridge University Press, 2020.
   Unit1: Chapter 1, 2

Unit 2: Chapter 3, 5.1,5.2,5.3,5.4,5.5
Unit 3: Chapter 8, 9.1,9.2,9.4,9.7,5.6.1,5.6.2
Unit 4: Chapter 10.2,10.5,5.6.3, 12

Reference Books:

1. Data Science from Scratch, Joel Grus, O'Rielly Publications, 2015.
2. 2) Introduction to Data Science, Laura Igual and Santi Segui, Springer International Publications, 2017.

Subject Title	:	**Advanced Quantitative Aptitude and Soft Skills**
Subject code	:	**UHS002N**
Semester	:	**5**
Credits with LTP Structure	:	**1 Credits (1L-0T-0P)**
Lecture Hours per Week	:	**1 Hours**
Tutorial Hours per Week	:	**0 Hours**
Total Contact Hours	:	**15 (15 Teaching Hours + 00 Tutorial Hours)**

Course Outcomes:
After completing the course the student will be able to:

6. Learnt the role of verbal and non-verbal communication and enhanced his/her ability to speak in public or to an audience.

7. Learned the techniques to augment his/her verbal ability.

8. Enhanced his/her written communication and learnt techniques to augment them further.

9. Understood analysis of the given problem and learnt to develop a method for solving it.

10. Enhanced and augmented his/her ability to work with quantitative aptitude.

UNIT - I	04 Hours	Teaching	Tutorial

		Hours	Hours
Mathematical Ability: Averages, Percentages, Profit Loss, Interest, Time & Work		04	00
UNIT - II	04 Hours	Teaching Hours	Tutorial Hours
Analytical Ability: Analytical Puzzles, Data Analysis, Para-jumbles and miscellaneous questions		04	00
UNIT - III	04 Hours	Teaching Hours	Tutorial Hours
Group Discussions & Written Communication: Zero GD, Parameters of Evaluation, Introduction and Conclusion, Mock GDs, Introduction to Business Communication		04	00
UNIT - IV	03 Hours	Teaching Hours	Tutorial Hours
Written English: Error Detection & Correction, Letter/Email Writing		03	00

Text Books:

1. Innovations Unlimited Training Services, "Number Math Book 2", Padmashree Printers

2. Innovations Unlimited Training Services, "Logical Ability Book 2", Padmashree Printers

Reference Books:

1. R. S. Aggarwal, "A Modern Approach to Verbal and Non – Verbal Reasoning", Sultan Chand and Sons, New Delhi, 2018
2. R. S. Aggarwal, "Quantitative Aptitude", Sultan Chand and Sons, New Delhi, 2018
3. Chopra, "Verbal and Non – Verbal Reasoning", MacMillan India
4. M Tyra, "Magical Book on Quicker Maths", BSC Publications, 2018
5. Edward De Bono, "Lateral Thinking", Penguin Books, New Delhi, 2016

6th Semester 175 Credits

Subject Title	:	**Software Testing**
Subject code	:	**UIS607C**
Semester	:	**5**
Credits with LTP Structure	:	**3 Credits (3L-0T-0P)**
Lecture Hours per Week	:	**3 Hours**
Tutorial Hours per Week	:	**0 Hours**
Total Contact Hours	:	**40 (40 Teaching Hours + 00 Tutorial Hours)**

Course Outcomes:

After completing the course the student will be able to:

1. Identify errors, faults, failures, test process, correctness, reliability, oracles.
2. Comprehend the various testing models, defect management, quality attributes and test generation strategies.
3. To generate requirement based test cases (black box testing) and structural testing (white box testing).
4. Design the test cases to check data flow for the given program.
5. Develop test cases by using various adequacy criteria.
6. Apply various testing process to test a given small application.

UNIT - I	10 Hours	Teaching Hours	Tutorial Hours
BASICS OF SOFTWARE TESTING:		10	00

Human Errors and Testing; Software Quality; Requirements, Behavior and Correctness; Correctness versus Reliability; Testing and Debugging; Test Metrics. Testing and Verification; Defect Management; Execution History;Test-generation Strategies, Static Testing. Types of Testing.			
UNIT - II	**10 Hours**	**Teaching Hours**	**Tutorial Hours**
TEST GENERATION FROM REQUIREMENTS: Introduction; The Test-Selection Problem; Equivalence Partitioning; Boundary Value Analysis; Category-Partition Method. Cause-Effect Graphing.		**10**	**00**
UNIT - III	**10 Hours**	**Teaching Hours**	**Tutorial Hours**
STRUCTURAL TESTING: Overview; Statement testing; Branch testing; Condition testing, Path testing; Procedure call testing; Comparing structural testing criteria; The infeasibility problem. **DEPENDENCE, DATA FLOW MODELS, AND DATA FLOW TESTING:** Definition-Use pairs; Data flow analysis; Classic analyses; From execution to conservative flow analysis; Data flow analysis with arrays and pointers; Inter-procedural analysis; Overview of data flow testing; Definition-Use associations; Data flow testing criteria; Data flow coverage with complex structures; The infeasibility problem.		**10**	**00**
UNIT - IV	**10 Hours**	**Teaching Hours**	**Tutorial Hours**
TEST CASE SELECTION AND ADEQUACY: Overview; Test specification and cases; Adequacy criteria; Comparing criteria; **PROCESS:** Integration and component-based software testing: Overview; Integration testing strategies; Testing components and assemblies. System, Acceptance and Regression Testing: Overview; System testing; Acceptance testing; Usability; Regression testing; Regression test selection techniques; Test case prioritization and selective execution.		**10**	**00**
Text Books:			
1. **Foundations of Software Testing** Aditya P Mathur, Pearson Education, 2008. (chapter 1, 2) 2. **Software Testing and Analysis Process Principles and Techniques** Mauro Pezze, Michal Young, Wiley India, 2008. (chapter 6,9,12,13,20,21,22)			
Reference Books:			
1. **Software Testing Principles and Practices** Srinivasan Desikan, Gopalaswamy Ramesh, 2ndEdition, Pearson, 2007. 2. **Software Testing** Ron Patton, 2nd edition, Pearson, 2004. 3. **The Craft of Software Testing** Brian Marrick, Pearson, 1995.			

Subject Title	:	Computer Networks
Subject code	:	UIS623C
Semester	:	6
Credits with LTP Structure	:	4 Credits (3L-1T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	2 Hours
Total Contact Hours	:	40 (40 Teaching Hours + 26 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:

1. To comprehend basics of data communication system.
2. Enumerate the layers of the OSI, TCP/IP model and demonstrate functions of each layer and comprehend the concept of data link protocols.
3. To exhibit the ability to apply different error detection and correction technique to solve communication problem.
4. Demonstrate the ability to apply the concept of classfull and classless addressing with their respective address space in various networks.
5. Demonstrate the concept of internetworking, routing techniques of network layer.
6. Exhibit the ability to demonstrate the features and operations of various transport and application layer protocol such as TCP, UDP, DNS, and TELNET

UNIT - I	16 Hours	Teaching Hours	Tutorial Hours

Introduction: Data Communications: Components, Data representations, Data flow, Networks: Distributed Processing, Network Criteria, And Physical structures, Categories of Networks [LAN, WAN, MAN], Protocols: Key elements. **Network Models:** The OSI Model: layered architecture, peer to peer processes, and encapsulation, Layers in the OSI model : [Brief description of all seven layers], TCP / IP Protocol Suite: physical, data link, network, transport and application layer, Addressing: physical, logical and port addresses. **Physical Layer: Transmission Media**: Guided Media: Twisted pair cable, Coaxial cable, Fiber Optic cable, Unguided Media: Radio waves, Microwaves, Infrared.		**10**	**06**
UNIT - II	**16 Hours**	**Teaching Hours**	**Tutorial Hours**
Switching: Definition, Circuit switched networks, Data gram Networks, Virtual circuit networks. **Data Link Layer: Error detection and correction**: Cyclic codes: Checksum. **Data link control**: Protocols: Noiseless channels: Noisy channels.		**10**	**06**
UNIT - III	**17 Hours**	**Teaching Hours**	**Tutorial Hours**
Network Layer: Logical Addressing: IPv4 Addresses: Address Space, Notation, Classful Addressing, Classless Addressing, IPv6 Addresses: Structure, Address Space. **Network Layer :Internet Protocol:** IPv4, IPv6, Transition from IPv4 to IPv6 **Network Layer: Address mapping, Error Reporting, and Multicasting:** ARP, RARP, and ICMP. **Network Layer: Delivery, Forwarding & Routing:** Delivery, Forwarding: Routing Table, Unicast routing protocols: Distance vector routing [RIP Description], Link state routing [OSPF Description], Path vector routing [BGP Description].		**10**	**07**
UNIT - IV	**17 Hours**	**Teaching Hours**	**Tutorial Hours**
Transport Layer: Process to Process Delivery: UDP: TCP: TCP services, TCP features, Segment, A TCP connection. SCTP: SCTP services, SCTP features, Packet format, An SCTP association. **Congestion Control and Quality of Service:** Congestion control: Open loop congestion control and closed loop congestion control. **Application Layer:** Domain Name System: Name Space, Domain Name Space, DNS In The Internet, Resolution. **Remote Logging, Electronic Mail and File Transfer:** Remote logging: Telnet, Electronic mail: Architecture ,File Transfer: FTP		**10**	**07**
Text Books:			
1. Data Communications and Networking Behrouz A. Forouzan, 4th Edition, Tata McGrawHill, 2006. 　[**Unit-I:** Chapters 1, 2 ,7　**Unit-II:** Chapters 8, 10, 11　**Unit-III:** Chapters 19,20, 21,22 　**Unit-IV:**　Chapters 23, 24, 25 and 26　]			
Reference Books:			
1. Communication Networks –Fundamental Concepts and Key Architectures Alberto LeonGarcia and Indra Widjaja, 2 nd Edition, Tata McGrawHill, 2004.			

2. Computer and Communication Networks Nader F. Mir, Pearson Education, 2007.
3. Data and Computer Communication William Stallings, 8 th Edition, Pearson Education, 2007.
4. Computer Networks – A Systems Approach Larry L. Peterson and Bruce S. David, 4th Edition, Elsevier, 2007.
5. Introduction to Data Communications and Networking – Wayne Tomasi, Pearson Education, 2005.

Subject Title	:	Advanced Java Programming
Subject code	:	UIS048E
Semester	:	6
Credits with LTP Structure	:	3 Credits (3L-0T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	40 (40 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:
After completing the course the student will be able to:
1. Build Java applets for solving given problems.
2. Use Java applets for event handling.
3. Implement J2EE applications using Java servlets.
4. Apply the concept of database connectivity using java applications.
5. Deploy enterprise web applications using JSP.

UNIT - I	10 Hours	Teaching Hours	Tutorial Hours
Applets and Event Handling **The Applet Class:** Two types of Applets, Applet basics, Applet Architecture, An Applet skeleton, Simple Applet display methods, Requesting repainting, The HTML'APPLET' tag, Passing parameters to Applets. **Event Handling:** Two Event Handling Mechanisms, The Delegation Event Model, Event Classes, Sources of Events, Event Listener Interfaces, Using the		10	00

Delegation Event Model			
UNIT - II	**10 Hours**	**Teaching Hours**	**Tutorial Hours**
Java2 Enterprise Edition and Servlets **Java2 Enterprise Edition(J2EE) Overview:** J2EE and J2SE, The Birth of J2EE, Databases, The maturing of Java, Java beans and java message service, need for J2EE. **Multi-Tier architecture**: Distributive Systems, The tier, J2EE multitier architecture. **Servlets**: Java Servlets and Common Gateway Interface Programming, A Simple Java Servlet. Anatomy of a Java Servlet, Reading data from a client, Reading HTTP request headers, Sending data to a client and Writing the HTTP response header, Working with Cookies, Tracking Sessions.		**10**	**00**
UNIT - III	**10 Hours**	**Teaching Hours**	**Tutorial Hours**
JDBC and Embedded SQL **JDBC Objects:** The concepts of JDBC, JDBC Drivers Types, JDBC Packages, A brief overview of the JDBC Process, Database connection, Statement Objects, ResultSet, Transaction Processing, Metadata, Data Types, Exceptions **JDBC and Embedded SQL**: Model programs, Tables, Inserting data into tables, Selecting data from a table, Updating tables, Deleting data from a table.		**10**	**00**
UNIT - IV	**10 Hours**	**Teaching Hours**	**Tutorial Hours**
Java Server Pages (JSP) **JSP Syntax and semantics**: JSP Overview**,** The JSP Development model, Components of JSP Page, A complete example, Expressions, Scriptlets and Declarations: Expressions, Scriptlets, and Declarations. **Request dispatching:** Anatomy of request processing, Including other resources, The include directive, The <jsp:include> action, Method to be used, Forwarding requests.		**10**	**00**
Text Books:			
1. The Complete Reference -Java, Herbert Schildt, 7th edition, McGraw Hill Publication.(Chapters 21,22) 2. The Complete Reference –J2EE, Jim Keogh, McGraw Hill Publication.(Chapters 1, 2, 6, 7, 10) 3. The Complete Reference –JSP 2.0, Phil Hanna, McGraw Hill Publication.(Chapters 4, 5, 6, 7)			
Reference Books:			
1. Java 6 Programming Black Book, Dreamtech Press. 2007. 2. Core servlets and Java Server Pages, Marty Hall, Larry Brown, Volume 1: Core Technologies, Second Edition.			

Subject Title	:	Database Management Systems		
Subject Code	:	UIS002N		
Semester	:	6		
Credits with LTP Structure	:	3 Credits (3L-0T-0P)		
Lecture Hours per Week	:	3 Hours		
Tutorial Hours per Week	:	0 Hours		
Total Contact Hours	:	40 (40 Teaching Hours + 00 Tutorial Hours)		

Course Outcomes:

After completing the course the student will be able to:

1. Comprehend the fundamentals of DBMS concepts, its applications etc.
2. Identify entities, attributes, relationships between entities, their type etc., and draw the ER diagram for a given small problem.
3. Normalise the relations up to 3NF/BCNF and Design a relational schema.
4. Use SQL commands and constructs to create, update and retrieve data from tables.
5. Understand the concepts of transaction processing.
6. Learn various recovery algorithms.

Unit –I	10 Hours	Teaching Hours	Tutorial Hours
INTRODUCTION: Characteristicsofdatabaseapproach;AdvantagesofusingDBMSapproach; Usage of DBMS. Data models, schemas and instances; Three-schema		**10**	**00**

architectureanddataindependence;Databaselanguagesandinterfaces;Thedatabase systemenvironment;Centralizedandclient-serverarchitectures;ClassificationofDatabaseManagementsystems. **ENTITY-RELATIONSHIP MODEL**: Using High-Level Conceptual Data Models for DatabaseDesign;Anexample databaseapplication;Entity types,Entitysets,AttributesandKeys;Relationshiptypes, Relationship sets, RolesandStructural constraints; Weakentitytypes;Refining the ER Design; ER Diagrams, Naming conventions and design issues.		
Unit –II 10 Hours	**Teaching Hours**	**Tutorial Hours**
RELATIONALMODEL AND RELATIONAL DATABASE CONSTRAINTS: Relational model concepts; Relational modelconstraints and Relational database schemas; Update operations, Transaction and dealing with constraint violations. **DATABASEDESIGN**:Informaldesignguidelinesforrelationschemas;Functionald ependencies; Normal forms based on primary keys; General definitions of second and thirdnormalforms; Boyce-CoddNormalForm.	10	00
Unit -III 10 Hours	**Teaching Hours**	**Tutorial Hours**
SQL: data definition and data types; Specifying basic constraints in SQL; Schema changestatements in SQL; Basic queries in SQL; More complex SQL queries. Insert, Delete and Update statements in SQL; Specifying constraintsas Assertion and Trigger; Views(Virtual Tables) inSQL;	10	00
Unit-IV 10 Hours	**Teaching Hours**	**Tutorial Hours**
TRANSACTION MANAGEMENT: Introduction to transaction processing; Transaction &system concepts; Desirable properties of transactions; Characterizing schedules based onrecoverability; Characterizing schedules based on serializability; Transaction support in SQL; Transaction Controlin SQL. **RECOVERY ALGORITHMS:**	10	00
Text Book(s):		
1. FundamentalsofDatabaseSystems",RemezElmasri&ShamkantB.Navathe,5thEdition,Pearson Education		
Reference Books:		
1. DatabaseManagementSystems", RamakrishananGehrke3rdedition, McGraw-HillHigherEducation; 2. "AnIntroductiontoDatabase systems", C. J.Date, AddisonWesley, 4thedition.		

Subject Title	:	**Career Planning and Professional Skills**
Subject code	:	**UHS003N**
Semester	:	**6**
Credits with LTP Structure	:	**1 Credits (1L-0T-0P)**
Lecture Hours per Week	:	**1 Hours**
Tutorial Hours per Week	:	**0 Hours**
Total Contact Hours	:	**15 (15 Teaching Hours + 00 Tutorial Hours)**

Course Outcomes:
After completing the course the student will be able to:
1. Learnt to handle personal interviews successfully.
2. Enhanced the usage and understanding of the various structures in the English Language.
3. Augmented his/her leadership and team workmanship skills.
4. Understood analysis of the given problem and learnt to develop a method for solving it.
5. Enhanced and augmented his/her ability to work with quantitative problems.

UNIT - I	04 Hours	Teaching Hours	Tutorial Hours
Reasoning Ability: Boolean Logic, Cryptarithms, Critical Reasoning, Verbal and Non-Verbal Reasoning		**04**	**00**
UNIT - II	04 Hours	Teaching Hours	Tutorial Hours

Written & Spoken English: Reading Comprehension, Sentence Completion, Recap of sounds and stress, Pausing and Rhythm		03	00
UNIT - III	04 Hours	Teaching Hours	Tutorial Hours
Hrs. Mathematical Thinking: Taking time to Work with Distances, Permutations, Probability, Data Sufficiency		04	00
UNIT - IV	03 Hours	Teaching Hours	Tutorial Hours
Hrs. Interview Skills: Mock GDs, Résumé Writing, FAQs in HR Interviews, Interview Etiquette, Team & Leadership Skills		04	00

Text Books:

1. Innovations Unlimited Training Services, "Number Math Book 3", Padmashree Printers

2. Innovations Unlimited Training Services, "Logical Ability Book 1", Padmashree Printers

3. Innovations Unlimited Training Services, "Grammar & Comprehension Book 3", Padmashree Printers

Reference Books:

1. R. S. Aggarwal, "A Modern Approach to Verbal and Non – Verbal Reasoning", Sultan Chand and Sons, New Delhi, 2018
2. R. S. Aggarwal, "Quantitative Aptitude", Sultan Chand and Sons, New Delhi, 2018
3. Chopra, "Verbal and Non – Verbal Reasoning", MacMillan India
4. M Tyra, "Magical Book on Quicker Maths", BSC Publications, 2018
5. Edward De Bono, "Lateral Thinking", Penguin Books, New Delhi, 2016

7th Semester 175 Credits

Subject Title	:	**Object Oriented Modeling and Design**
Subject code	:	**UIS720C**
Semester	:	**7**
Credits with LTP Structure	:	**3 Credits (3L-0T-0P)**
Lecture Hours per Week	:	**3 Hours**
Tutorial Hours per Week	:	**0 Hours**
Total Contact Hours	:	**40 (40 Teaching Hours + 00 Tutorial Hours)**

Course Outcomes:
After completing the course the student will be able to:
1. Apply the Object Oriented approaches for modeling and design.
2. Analyze the structural and behavioral models using UML appropriate notations.
3. Design object oriented models for development of software applications.
4. Design suitable implementation methods for object oriented models.

UNIT - I	10 Hours	Teaching Hours	Tutorial Hours
INTRODUCTION, MODELING CONCEPTS, CLASS MODELING: Object Orientation, OO development, OO themes; Evidence for usefulness of OO development; OO modeling history. *Modeling as Design Technique:* Modeling; abstraction; the three models. Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.		10	00

Advanced Class Modeling: Advanced object and class concepts; Association ends; N-Ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips.			
UNIT - II	**10 Hours**	**Teaching Hours**	**Tutorial Hours**
STATE MODELING, ADVANCED STATE MODELING, INTERACTION MODELING, PROCESS OVERVIEW: **State Modeling:** Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips. **Advanced State Modeling:** Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips. **Interaction Modeling:** Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models.		**10**	**00**
UNIT - III	**10 Hours**	**Teaching Hours**	**Tutorial Hours**
SYSTEM CONCEPTION, DOMAIN ANALYSIS, APPLICATION ANALYSIS, AND SYSTEM DESIGN-1: **System Conception:** Devising a system concept; Elaborating a concept; Preparing a problem statement. **Domain Analysis:** Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis. **Application Analysis:** Application interaction model; Application class model; Application state model; Adding operations. **System Design -1:** Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy.		**10**	**00**
UNIT - IV	**10 Hours**	**Teaching Hours**	**Tutorial Hours**
SYSTEM DESIGN-2, CLASS DESIGN, IMPLEMENTATION MODELING, AND DESIGN PATTERNS: **System Design -2:** Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example. **Class Design:** Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example. **Implementation Modeling:** Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing.		**10**	**00**

Text Books:

1. Michael. Blaha, James. Rumbaugh **"Object-Oriented Modeling and Design with UML"**, 2nd Edition, Pearson Education, 2005.

Reference Books:

1. **Ali. Bahrami, "Object Oriented Systems Development",** McGraw-Hill, 2008.
2. Grady. Booch **"Object-Oriented Analysis and Design with Applications",** 3rd Edition, Pearson, 2007.
3. Mark. Priestley, **"Practical Object-Oriented Design with UML"**, 2nd Edition, Tata McGraw-Hill, 2003.

Subject Title	:	Internet of Things
Subject Code	:	UIS045E
Semester	:	7
Credits with LTP Structure	:	3 Credits (3L-0T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	40　　　(40 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:
After completing the course the student will be able to:
1. Comprehend the fundamentals of IoT.
2. Identify the challenges driving the architectures of IoT systems.
3. Identify design limitations and the role of IoT networks.
4. Analyze the data generated with IoT devices.
5. Use appropriate physical IoT devices to implement an application.
6. Design solutions to open ended problems using IoT.

UNIT –I	10 Hours	Teaching Hours	Tutorial Hours
Introduction to IoT: What is IoT? Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoTNetwork Architecture and Design: Drivers Behind New Network Architectures, Comparing IoTArchitectures, ASimplifiedIoTArchitecture,TheCoreIoTFunctionalStack,IoT Data Management and Compute Stack.		10	00

UNIT –II	10 Hours	Teaching Hours	Tutorial Hours

		Teaching Hours	Tutorial Hours
Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks,Connecting Smart Objects: Communications Criteria, IoT Access Technologies: Salient features ofprotocolstacksutilizingIEEE 802.15.4(Intd.): Zigbee Protocol, LoRaWAN		10	00

UNIT -III	10 Hours	Teaching Hours	Tutorial Hours
IP as the IoT Network Layer: The Business Case for IP, the need for Optimization, Optimizing IP for IoT, Application Protocols for IoT: The Transport Layer, IoT Application Transport Methods: CoAP, MQTT Data and Analytics for IoT: An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics.		10	00

UNIT -IV	10 Hours	Teaching Hours	Tutorial Hours
Securing IoT: A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVEandFAIR, The Phased Application of Security in an Operational Environment. IoT Physical Devices and Endpoints-Arduino UNO: Introduction to Arduino, Installing Software, Fundamentals of Arduino Programming, Example Modules on Arduino: Blinking an LED, Toggle the state of LED using Switch, Traffic light simulation for pedestrians, Interfacing Sensors to the Arduino: Temperature Sensor, Light Sensor, Ultrasonic Sensor, Interfacing Displays to Arduino: 7 Segment Display.		10	00

Text Book(s):

1) DavidHanes,GonzaloSalgueiro,PatrickGrossetete,RobertBarton,JeromeHenry,"IoTFundamentals:Networking Technologies, Protocols, and Use Cases for the Internet of Things", Edition, Pearson Education(CiscoPressIndian Reprint). (ISBN:978- 9386873743)
2) SrinivasaKG,"InternetofThings",CENGAGELeaningIndia,2017

Reference Books:

1. VijayMadisettiandArshdeepBahga,"InternetofThings(AHands-on- Approach)", 1st Edition, VPT, 2014. (ISBN:978-8173719547)
2. RajKamal,"InternetofThings:ArchitectureandDesignPrinciples",1stEdition,McGrawHillEducation,2017.(ISBN:978-9352605224)

Subject Title	:	Big Data and Analytics
Subject Code	:	UIS038E
Semester	:	7
Credits with LTP Structure	:	3 Credits (3L-0T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	40　　(40 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:
After completing the course the student will be able to:
1. Analyze the characteristics of digital data and it's challenges in Big data environment.
2. Analyze the challenges of big data analytics and its terminalogies that prevent businesses from capitalizing.
3. Build meaningful conversations on Big Data and analytics using Hadoop.
4. Identify suitable types of NoSQL databases to solve complex engineering problems.
5. Apply Hive and Pig tools on structured data for processinng and analyzing.

UNIT –I	10 Hours	Teaching Hours	Tutorial Hours
Types of Digital Data: Classification of Digital Data – Structured Data, Semi-Structured Data, and Unstructured Data. **Introduction to Big Data:** Characteristics of Data, Evolution of Big Data, Definition of Big Data,		10	00

Challenges with Big Data, What is Big Data? Other Characteristics of Data Which are not Definitional Traits of Big Data, Why Big Data? Are We Just an Information Consumer or Do we also Produce Information? Traditional Business Intelligence (BI) versus Big Data, A Typical Data Warehouse Environment, A Typical Hadoop Environment, What is New Today? What is changing in the Realms of Big Data? **Big Data Analytics:** Where do we Begin? What is Big Data Analytics? What Big Data Analytics Isn't? Why this Sudden Hype Around Big Data Analytics? Classification of Analytics, Greatest Challenges that Prevent Businesses from Capitalizing on Big Data, Top Challenges Facing Big Data, Why is Big Data Analytics Important? What Kind of Technologies are we looking Toward to Help Meet the Challenges Posed by Big Data? Data Science, Data Scientist. Terminologies Used in Big Data Environments, Basically Available Soft State Eventual Consistency (BASE), Few Top Analytics Tools.			

UNIT –II	10 Hours	Teaching Hours	Tutorial Hours
Big Data Technology Landscape - NoSQL (Not Only SQL) and Hadoop. **NoSQL (Not Only SQL)** - Where is it used? What is it?, Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, What we miss with NoSQL?, NoSQL Vendors, SQL Versus NoSQL, NewSQL, Comparison of SQL, NoSQL, and NewSQL. **Hadoop:** Features of Hadoop, Key advantages of Hadoop, Versions of Hadoop - Hadoop 1.0, Hadoop 2.0, Overview of Hadoop Ecosystems, Hadoop Versus, SQL, Integrated Hadoop systems offered by leading market vendors, Cloud based Hadoop solutions. Introducing Hadoop, Why Hadoop? Why not RDBMS?, RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Use Case of Hadoop, Hadoop Distributors, HDFS (Hadoop Distributed File System), Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator), Interacting with Hadoop Ecosystem.		10	00

UNIT -III	10 Hours	Teaching Hours	Tutorial Hours
Introduction to MongoDB: What is MongoDB? Why MongoDB?, Terms Used in RDBMS and MongoDB, Data Types in MongoDB, MongoDB Query Language.- Insert, Save, Update, Remove, find methods, Dealing with NULL values, Count, Limit, Sort and Skip Methods **Introduction to Cassandra:** An Introduction, Features of Cassandra, CQL Data types, CQLSH, Keyspaces, CRUD (Create, Read, Update and Delete) Operations, Collections..		10	00

UNIT -IV	10 Hours	Teaching Hours	Tutorial Hours
Hive: What is Hive?, Hive Architecture, Hive Data Types, Hive File Formats, Hive Query Language (HQL), RCFile Implementation, SerDe, User-defined Function (UDF). **Introduction to Pig:** What is Pig?, The Anatomy of Pig, Pig on Hadoop, Pig Philosophy, Use Case for Pig: ETL Processing, Pig Latin Overview, Data Types in Pig, Running Pig, Execution Modes of Pig, Relational Operators, Eval Function, Complex Data Types.		10	00

Text Book(s):			
1. Seema. Acharya and Subhashini. C, "Big Data and Analytics", 1st Edition, Wiley India, 2015 (Chapters 1,2,3,4,5,6,7,9,10).			

Reference Books:

1. Bart. Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", 1st Edition, Wiley, 2014.
2. DT Editorial Services, "Big Data: Black Book, Comprehensive Problem Solver", 1st Edition, Dreamtech Press, 2016.
3. Tom. White, "Hadoop – The Definitive Guide", 3rd Edition, O'Reilly, 2012.
4. Alex Holmes, "Hadoop in Practice", 2nd Edition, Dreamtech Press India Pvt. Ltd, 2014.
5. Dayong. Du, "Apache Hive Essentials", 2nd Edition, Packt Publishing Limited, 2018.
6. Alan. Gates, "Programming Pig", 2nd Edition, Shroff/O'Reilly, 2016.
7. Alan. Gates, "Programming Pig: Dataflow Scripting with Hadoop", 2nd Edition, Shroff/O'Reilly, 2016.

UIS049E: CYBER SECURITY
3-0-0(L-T-P)

Credits	:	03	**Semester**	:	07
Total Teaching Hours	:	40	**No. of Lecture Hrs/Week**	:	03
Total Tutorial Hours	:	00	**No. Tutorial Hrs/Week**	:	00
SEE Marks	:	50	**CIE Marks**	:	50
Total Contact Hours	:	50 (50L + 0T)	**Exam Hours**	:	03
Prerequisite	:	There are no prerequisites for this course. However, a fundamental knowledge in computers is desirable to understand the terminology and concepts better.			
Course Objectives	:	1. To understand various types of cyber-attacks and cyber-crimes 2. To learn threats and risks within context of the cyber security 3. To have an overview of the cyber laws & concepts of cyber forensics 4. To study the defensive techniques against these attacks			

Unit –I	10 Lecture + 00 Tutorials

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International

Law. The INDIAN Cyberspace, National Cyber Security Policy.	
Unit –II	**10 Lecture + 00 Tutorials**

Cyber forensics: Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Organizational security Policies and Measures in Mobile Computing Era, Laptops.

Unit –III	**10 Lecture + 00 Tutorials**

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Datalinking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains-medical, financial, etc

Unit-IV	**10 Lecture + 00 Tutorials**

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Datalinking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains-medical, financial, etc

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. **Mini-Cases:** The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

Text Book	:	1. Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes,Computer Forensics and Legal Perspectives,Wiley 2. B.B.Gupta, D.P.Agrawal, HaoxiangWang, Computerand CyberSecurity: Principle s, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335,2018
Reference Book(s)	:	1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRCPress. 2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&FGroup.

8th Semester 175 Credits

Subject Title	:	NOSQL
Subject Code	:	UIS039E
Semester	:	8
Credits with LTP Structure	:	3 Credits (3L-0T-0P)
Lecture Hours per Week	:	3 Hours
Tutorial Hours per Week	:	0 Hours
Total Contact Hours	:	40 (40 Teaching Hours + 00 Tutorial Hours)

Course Outcomes:

After completing the course the student will be able to:

6. Explain and compare different types of NoSQL Databases.
7. Compare and contrast RDBMS with different NoSQL databases.
8. Demonstrate the detailed architecture and performance tune of Document-oriented NoSQL databases.
9. Explain performance tune of Key-Value Pair NoSQL Databases.
10. Apply NoSQL development tools on different types of NoSQL Databases.

UNIT –I	10 Hours	Teaching Hours	Tutorial Hours
What is NoSQL? Where is it used? What is it? Features of NoSQL. Types of NoSQL Databases. Why NoSQL? Advantages of NoSQL. The Value of		10	00

Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedence Mismatch, Application and Integration Databases, Attack of the Cluster, The Emergence of NoSQL, Comparison of relational databases to NoSQL , Application, RDBMS approach, Challenges.			
UNIT –II	**10 Hours**	**Teaching Hours**	**Tutorial Hours**
NoSQL key/value databases using MongoDB, Document Databases, Document oriented Database features, Consistency, Transactions, Avalability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against varying Aggregate structure. MongoDB Query Language		**10**	**00**
UNIT -III	**10 Hours**	**Teaching Hours**	**Tutorial Hours**
Column-oriented NoSQL databases using Apache Cassandra, Column-Family Data store features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage. Cassaandra Query Language Graph Databases. What is Graph Database. Features. Consistency, Transactions, Availability, Query Featur Dataes, Scaling. Suitable Use Cases.		**10**	**00**
UNIT -IV	**10 Hours**	**Teaching Hours**	**Tutorial Hours**
Schema Migrations: Schema Changes, Schema Changes in RDMBS, Schema changes in a NoSQL Datastore, Polyglot Perstenence, Beyond NoSQL, Choosing Your Database		**10**	**00**

Text Book(s):

1. Sadalage.P & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persitence, Wiley Publications, 1st Edition, 2019
2. Getting Started with NoSQL: Your Guide to the world and Technology of NoSQL- Gaurav Vaish, Packt Publishing

Reference Books:

1. Seema Acharya and Subhashini Chellappan – Big Data and Analytics, Wiley India Pvt Ltd
2. Dan Sullivan, "NoSQL For Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN-13:978-9332557338)
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