SCHEME & SYLLABUS

Department of Information Science and Engineering

Dean Academic
Global Academy of Technology,
Raja...hwarinagar, Beng...98

Head of Department
fo. Science Engineer
bal Academy of Techn
Bangalore - 98

III -VIII Semester Scheme (2021-22)

Information Science & Engineering

AUTONOMOUS - NEP

GLOBAL ACADEMY OF TECHNOLOGY
(Autonomous institution affiliated to VTU, Belagavi.
Accredited by NAAC with 'A' grade,
NBA Accredited CS, E&C, E&E, MECH and IS branches)
Ideal Homes Township,
Raja Rajeshwari Nagar, Bengaluru-560098.

Draft scheme of UG Autonomous Program – 2021batch (3rd to 8th Semester)

III SEMESTER

Sl. No.	Course Code	Course Title	Course Type	Teaching Dept.	Teaching Hours/Week			Examination			CREDITS
					L	T	P	CIE	SEE	Total	
1	21MAT31X	Mathematics course	BS	MAT	2	2	0	50	50	100	3
2	21ISE32	Data Structures (Integrated)	IPC	Respective Department	3	0	2	50	50	100	4
3	21ISE33	Unix Shell Programming (Integrated)	IPC		3	0	2	50	50	100	4
4	21ISE34	Computer Organization	PC		3	0	0	50	50	100	3
5	21ISE35	Operating Systems	PC		3	0	0	50	50	100	3
6	21CPH36/46	Constitution of India and Professional Ethics	HSM	Any Department	1	0	0	50	50	100	1
	OR										
	21KSK37/47	Samskrutika Kannada									
	21KBK37/47	Balake Kannada									
7	21ISE371	Biology for Engineers	PC	Respective Department	1	0	0	50	50	100	1
	21ISE372	Soft Skills and Relationships									
				Total				**350**	**350**	**700**	**19**

8	21MATDIP31	Additional Mathematics (For Lateral Entry Students)	BS	MAT	2	2	0	100	--	100	0

IV SEMESTER

Sl. No.	Course Code	Course Title	Course Type	Teaching Dept.	Teaching Hours/Week			Examination			CREDITS
					L	T	P	CIE	SEE	Total	
1	21MAT41X	Mathematics course (Discrete Mathematics – II)	BS	MAT	2	2	0	50	50	100	3
2	21ISE42	Design and Analysis of Algorithm using C (Integrated)	IPC	Respective Department	3	0	2	50	50	100	4
3	21ISE43	Object Oriented Concepts using JAVA (Integrated)	IPC		3	0	2	50	50	100	4
4	21ISE44	Data Communications	PC		3	0	0	50	50	100	3
5	21ISE45	Software Engineering and Agile Methodologies	PC		3	0	0	50	50	100	3
6	21CPH36/46	Constitution of India and Professional Ethics	HSM	Any Department	1	0	0	50	50	100	1
	OR										
	21KSK37/47	Samskrutika Kannada									
	21KBK37/47	Balake Kannada									
7	21ISE471	Environmental Studies	PC	Respective Department	1	0	0	50	50	100	1
	21ISE472	Personality Development									
8	21INT48	Inter/Intra Institutional Internship	INT	Respective Department	0	0	3	100	-	100	2
							Total	**450**	**350**	**800**	**21**

V SEMESTER

Sl. No.	Course Code	Course Title	Course Type	Teaching Dept.	Teaching Hours/Week			Examination			CREDITS
					L	T	P	CIE	SEE	Total	
1	21ISE51	Theory of Computations	PC	Respective Department	2	2	0	50	50	100	3
2	21ISE52	Database Management Systems (Integrated)	IPC		3	0	2	50	50	100	4
3	21ISE53	Computer Networks (Integrated)	IPC		3	0	2	50	50	100	4
4	21ISE54X	Program Elective 1	PEC		3	0	0	50	50	100	3
5	21ISE55	Research Methodology	AEC		3	0	0	50	50	100	3
6	21ISE561	Physical Activity Health and Wellness	AEC		1	0	0	50	50	100	1
	21ISE562	Leadership and Management Skills									
7	21CIV57/67	Environmental Science	HSM	Civil	1	0	0	50	50	100	1
	OR										
	21UHV57/67	Universal Human Values and Ethics	HSM	Any Department							
							TOTAL	350	350	700	19

Program Elective -1

Sl.No.	Course Code	Course Title
1	21ISE541	Introduction to Artificial Intelligence
2	21ISE542	Data Mining
3	21ISE543	Computer Graphics
4	21ISE544	Cloud Computing

VI SEMESTER

Sl. No.	Course Code	Course Title	Course Type	Teaching Dept.	Teaching Hours/Week			Examination			CREDITS
					L	T	P	CIE	SEE	Total	
1	21ISE61	Web Technologies	PC	Respective Department	3	0	0	50	50	100	3
2	21ISE62	Machine Learning (Integrated)	IPC		3	0	2	50	50	100	4
3	21ISE63	Wireless Sensor Network and IOT (Integrated)	IPC		3	0	2	50	50	100	4
4	21ISE64X	Program Elective 2	PEC		3	0	0	50	50	100	3
5	21ISE65X	Open Elective 1	OEC	Respective Offering Department	3	0	0	50	50	100	3
6	21ISE661	Society, Culture and Human Behavior	AEC	Respective Department	1	0	0	50	50	100	1
	21ISE662	Financial Literacy and Banking									
7	21CIV57/67	Environmental Science	HSM	Civil	1	0	0	50	50	100	1
	OR										
	21UHV57/67	Universal Human Values and Ethics	HSM	Any Department							
8	21MPT68	Mini Project	MP	Respective Department	Two Contact hours per week			50	50	100	2
							TOTAL	**400**	**400**	**800**	**21**

Program Elective 2

Sl.No.	Course Code	Course Title
1	21ISE641	Cryptography
2	21ISE642	Advanced Java
3	21ISE643	Business Intelligence
4	21ISE644	Augmented Reality and Virtual Reality

Open Elective 1

Sl.No.	Course Code	Course Title
1	21ISE651	Introduction to Operating Systems
2	21ISE652	Introduction to Data Structures
3	21ISE653	Introduction to Java
4	21ISE654	Introduction to Computer Networks

VII SEMESTER

Sl. No.	Course Code	Course Title	Course Type	Teaching Dept.	Teaching Hours/Week			Examination			CREDITS
					L	T	P	CIE	SEE	Total	
1	21ISE71	Cyber Security and Ethical Hacking	PC	Respective Department	3	0	0	50	50	100	3
2	21ISE72	Deep Learning (Integrated)	IPC		3	0	2	50	50	100	4
3	21ISE73	Big Data Analytics (Integrated)	IPC		3	0	2	50	50	100	4
4	21ISE74X	Program Elective 3	PEC		3	0	0	50	50	100	3
5	21ISE75X	Open Elective 2	OEC	Respective Offering Department	3	0	0	50	50	100	3
6	21ISE76	Project Phase 1	MP	Two Contact hours per week				100	-	100	2
				TOTAL				**350**	**250**	**600**	**19**

Program Elective 3

Sl.No.	Course Code	Course Title
1	21ISE741	Mobile Communications
2	21ISE742	Software Testing
3	21ISE743	User Interface Design
4	21ISE744	Storage Area Network

Open Elective 2

Sl.No.	Course Code	Course Title
1	21ISE751	Introduction to Artificial Intelligence
2	21ISE752	Introduction to Robotics
3	21ISE753	Introduction to Data Base Management Systems
4	21ISE754	Introduction to Web Designing

VIII SEMESTER

Sl. No.	Course Code	Course Title	Course Type	Teaching Dept.	Teaching Hours/Week			Examination			CREDITS
					L	T	P	CIE	SEE	Total	
1	21ISE81X	Program Elective 4	PEC	Respective Department	3	0	0	50	50	100	3
2	21ISE82X	Program Elective 5	PEC		3	0	0	50	50	100	3
3	21ISE83	Project work phase – II	MP	Two Contact hours per week				100	100	200	12
4	21ISE84	Technical Seminar	MP	One Contact hours per week				100	--	100	1
5	21ISE85	Internship	INT	Completed during the intervening period of VI and VII Semester				100	--	100	2
				TOTAL				**400**	**200**	**600**	**21**

Program Elective 4

Sl.No.	Course Code	Course Title
1	21ISE811	Block Chain Technologies
2	21ISE812	System Modeling and Simulation
3	21ISE813	Software Architecture and Design Pattern
4	21ISE814	Green Computing

Program Elective 5

Sl.No.	Course Code	Course Title
1	21ISE821	Bioinformatics
2	21ISE822	Advanced Computer Architecture
3	21ISE823	IT Law and Ethics
4	21ISE824	Social Network Analysis

3rd Semester Syllabus

SEMESTER – III

Course: Discrete Mathematics – I

(Common for CSE/ISE/AI&DS /AI&ML)

Course Code	21MAT31A	CIE Marks	50
Hours/Week (L: T: P)	2:2:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Course Learning Objectives: To enable students to apply the knowledge of Mathematics in fields of computer science and allied branches by making them to learn:

CLO1	Counting Principles
CLO2	Mathematical Logic and Set Theory
CLO3	Well ordering principle and Properties of Integers.
CLO4	Probability and Random Variables

Content	No. of Hours/ RBT levels
Module 1 The Rules of Sum and Product, The Pigeon-hole Principle, Permutations, Combinations, The Binomial Theorem, Combinations with Repetition.	**08 Hours L2, L3**
Module 2 Sets and Subsets, Set operations and Laws of Set Theory. Counting and Venn Diagrams. Probability, Conditional probability and Bayes Theorem.	**08 Hours L2, L3**
Module 3 Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implications: Rules of Inference. Quantifiers, Definitions and the Proofs of Theorems.	**08 Hours L2, L3**
Module 4 The Well-Ordering Principle: Mathematical Induction, Recursive Definitions, The division algorithm, Euclidian algorithm, Fundamental theorem of arithmetic.	**08 Hours L2, L3**
Module 5 Random Variable, Binomial, Poisson, Exponential and Normal distributions. Joint distributions, Expectation and Covariance.	**08 Hours L2, L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21MAT31.1	Use computational techniques essential for the study of mathematical logic, set operations, counting principles and properties of integers.
21MAT31.2	Solve problems associated with random variables using probability distributions

Textbooks:

1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education. 2020.
2. T Veerarajan, Probability, Statistics and Random Processes for Engineers, Tata McGraw Hill, 3rd Edition, 2008

Reference books:

1. Kenneth H. Rosen: Discrete Mathematics and its Applications, 6th Edition, McGraw Hill, 2007
2. Richard H Williams, Probability, Statistics and Random Processes for Engineers, Cengage Learning, 1st Edition, 2003

Scheme of Examination:

Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of three sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average of Marks scored in all three tests is added to test component. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs), and three tests. **Some possible AATs:** seminar/assignments/ mini-projects/ concept videos/ partial reproduction of research work/ group activity/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

Component		Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Assignments	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21MAT31.1	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-	-
21MAT31.2	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-	-
Average	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-	-

Low-1: Medium-2: High-3

SEMESTER – III

Course: Data Structures (Integrated)

Course Code	21ISE32	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	4	Examination Hours	3

Prerequisites: C Programming

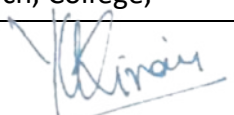
Course Learning Objectives:

CLO1	Explain fundamentals of data structures and their applications essential for Programming /problem solving.
CLO2	Find suitable data structure during application development/Problem Solving.
CLO3	Illustrate linear representation of data structures: Stack, Queues, Lists,
CLO4	Explain Non-Linear representation of data structures like Trees and Graphs and its memory Representation.
CLO5	Demonstrate sorting and searching algorithms

Content	No.of Hours/ RBT levels
Module 1 **Introduction:** Data Structures, Classifications (Primitive & Non Primitive), Data structure Operations, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation and its Functions, Representation of Linear Arrays in Memory. **Array Operations:** Review of Arrays, Traversing, inserting, deleting, searching, and sorting, Sparse Matrices. **Strings:** Basic Terminology, Storing, Operations and Pattern Matching algorithms. Programming Examples, Pattern matching algorithms-Brute force.	**10 Hours L2**
Module 2 **Stacks:** Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. **Queues:** Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Priority Queues, Programming Examples.	**10 Hours L3**
Module 3 **Linked Lists:** Definition, Representation of linked lists in Memory, Memory allocation. **Linked list operations:** Traversing, Searching, insertion, and Deletion, Doubly Linked lists, Circular linked lists, Linked Stacks and Queues, Applications of Linked lists, Programming Examples.	**10 Hours L3**
Module 4 **Trees:** Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - In order, Post order, Preorder, **Binary Search Trees** – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees- Evaluation of Expression, Programming Examples.	**10 Hours L3**

Module 5 **Advanced Trees:** AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion. **Sorting**: Insertion Sort and Radix sort. **Hashing**: Hash Table organizations, Hashing Functions, Static and Dynamic Hashing.	**10 Hours L3**

Program List	
1	Design, Develop and Implement a menu driven Program in C for the following array operations. a. Creating an array of N Integer Elements b. Display of array Elements with Suitable Headings c. Inserting an Element (ELEM) at a given valid Position(POS) d. Deleting an Element at a given valid Position(POS) e. Exit. Support the program with functions for each of the above operations.
2	Design, Develop and Implement a Program in C for the following operations on Strings. a. Read a main String (STR), a Pattern String (PAT) and a Replace String(REP) b. Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR Support the program with functions for each of the above operations. Don't use Built-in functions.
3	Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate how Stack can be used to check Palindrome d. Demonstrate Overflow and Underflow situations on Stack e. Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations
4	Design, Develop and Implement a menu driven Program in C for the following operations on QUEUE of Integer (Array Implementation of QUEUE with maximum size MAX) a. Enqueue an Element on to Queue b. Dequeue an Element from Queue c. Demonstrate Overflow and Underflow situations on Queue d. Display the status of Queue e. Exit Support the program with appropriate functions for each of the above operations
5	a. Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, % (Remainder), ^(Power) and alphanumeric operands. b. Design, Develop and Implement a Program in C for evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %.
6	Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Branch, College,



	a. Create a SLL of N Students Data by using front insertion. b. Display the status of SLL and count the number of nodes in it. c. Perform Insertion / Deletion at End of SLL. d. Perform Insertion / Deletion at Front of SLL. e. Exit.
7	Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, Phone Number. a. Create a DLL of N Employees Data by using end insertion. b. Display the status of DLL and count the number of nodes in it c. Perform Insertion and Deletion at End of DLL d. Perform Insertion and Deletion at Front of DLL e. Demonstrate how this DLL can be used as Double Ended Queue. f. Exit
8	Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers. a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5,2 b. Traverse the BST in Inorder, Preorder and Post Order.
9	Design, Develop and Implement a menu driven Program in C for the following operations on a. Radix Sort b. Insertion Sort
10	Given a File of N employee records with a set K of Keys (4-digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table (HT) of m memory locations with L as the set of memory addresses (2- digit) of locations in HT. Let the keys in K and addresses in L are Integers. Design (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using probing

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE32.1	Understand the basic data structures and its representation in memory
21ISE32.2	Apply appropriate algorithm for problem solving using arrays, strings, stacks, queues.
21ISE32.3	Explain the representation of linked lists, trees in memory.
21ISE32.4	Solve programs using linked lists and tree for a given specification.
21ISE32.5	Utilize the concepts of Hashing and Sorting to resolve problems

Textbooks:

1. Fundamentals of Data Structures in C, Ellis Horowitz and SartajSahni,2nd Ed, Universities Press, 2019.

2. Data Structures using C, A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

Reference books:

1. Data Structures: A Pseudo-code approach with C, Gilberg & Forouzan, 2nd Ed, Cengage Learning,2014.

2. Data Structures using C, Reema Thareja, 3rd Ed, Oxford press, 2018.

MOOCs:

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests for theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Lab CIE is conducted for 20 marks and is added to theory component.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test-3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE32.1	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
21ISE32.2	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
21ISE32.3	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
21ISE32.4	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
21ISE32.5	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-
Average	3	3	2	-	2	-	-	-	-	-	-	3	3	-	-	-

Low-1: Medium-2: High-3

SEMESTER – III

Course: UNIX Shell Programming (Integrated)

Course Code	21ISE33	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	4	Examination Hours	03

Prerequisites: C programming Basics, Overview of Linux Operating system.

Course Learning Objectives:

CLO1	Understand the philosophy of Unix Operating System and Control Unix using command line interface.
CLO2	Obtain an insight of programming in Bourne Shell, Bash Shell.
CLO3	Apply regular expressions and Edit streams.
CLO4	Demonstrate programming using Perl scripts.
CLO5	Explore networking tools for security.

Content	No.of Hours/ RBT levels
Module 1 **Unix Architecture and Command Usage:** Architecture of Unix, Features of Unix,POSIX and Single UNIX specification, Internal and External commands, Command structure, man: browsing the manual pages on-line, Understanding the man documentation, General Purpose utilities – cal, date, echo, bc, script, passwd, who, uname, tty, sty. **File System:**The File, The parent – child relationship, the HOME and PATH variable, pwd,cd, mkdir, rmdir, absolute pathname, relative pathname, .and .. , ls options. **Handling Ordinary Files**: cat, cp, rm, mv, file, wc,od, cmp,diff, gzip, tar,unzip.	**12 Hours L2**
Module 2 **File Attribute:**ls –l, -d option, file ownership, changing file permissions, chmod, directory permissions, changing file ownership. **More File Attributes:** File systems and nodes, hard links, symbolic links and ln, the directory, unmask, modification and access times, touch, find. **Filters using regular expressions:** pr, head, tail, cut, paste, sort, uniq, tr, grep andsed: grep, Basic Regular Expressions (BRE), Extended Regular Expressions (ERE)and egrep.	**10 Hours L3**

Module 3 **Shell Programming:** The shells interpretive cycle: Wild cards. Removing the special meanings of wild cards. Three standard files and redirection, Pipes, tee, command substitution, shell variables. Shell programming: Ordinary and environment variables. The profile. Read and read only commands. Command line arguments. exit and exit status of a command. Logical operators for conditional execution. The test command and its shortcut. The if, while, for and case control statements. The set and shift commands and handling positional parameters. Simple shell program examples.	**10 Hours L3**
Module 4 **Perl- The Master Manipulator:** Perl preliminaries, chop function, variables and operators, string handling functions, Specifying filenames in command line, $_:, Lists and Arrays, for each, split, join, grep, associative arrays, file handling, file tests.	**10 Hours L3**
Module 5 **Networking Tools:** TCP/IP basics, Resolving IP addresses, The applications, ping, telnet, ftp, Basic File and Directory Handling, Cryptography Basics, SSH, The SSH Tools, DNS.	**08 Hours L3**

Program List	
1	a). To learn and explore various features and controls of vi editor
2	a). To query a data file using filter commands in UNIX b). To search for a regular expression in a file using grep command in UNIX.
3	a). Write a shell that takes a valid directory name as an argument and recursively descend all the subdirectories, finds the maximum length of any file in that hierarchy and writes this maximum value to the standard output. b). Write a shell script that accepts a path name creates all the components in that path name as directories. For example, if the script is named mpc, then command mpc a/b/c/d should create directories a, a/b, a/b/c, a/b/c/d.
4	a). Write a shell script to find a file/s that matches a pattern given as command line argument in the home directory, display the contents of the file and copy the file into the directory ~/mydir. b). Write a shell script to list all the files in a directory whose filename is at least 10 characters. (use expr command to check the length).
5	a). Write a shell script that accept the file name, starting and ending line number as an argument and display all the lines between the given line number. b). Write a shell script that folds long lines into 40 columns. Thus any line that exceeds 40 characters must be broken after 40th, a "\" is to be appended as the indication of folding and the processing is to be continued with the residue. The input is to be supplied through a text file created by the user.
6	a). Write a shell script to simulate the working of a simple calculator given two integers. There are two division options: one returns the quotient and the other returns reminder. The Script requires 3 arguments: The operation to be used and two integer numbers. The options are add(-a), subtract(-s), multiply(-m), quotient(-c) and reminder (-r).

7	a). Write a shell script to generate a multiplication table. b). Write a shell script to print the Fibonacci series.
8	a). Write a perl script to check a number is prime or not. b). Write a perl script to compute the nth power of a given number
9	a). Write a perl script that performs bubble sort on an array of strings. b). Write a perl program to read a list of n numeric's from STDIN and find the max, min. Input the size of the list n interactively.
10	a). Write a bash/shell script to scan a network subnet b). Write a bash/shell script to notify via email when a network host is down c). Write a bash/shell script to create a network monitoring log

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE33.1	Explain multi user OS UNIX and its basic features
21ISE33.2	Interpret UNIX Commands, Shell basics, and shell environments
21ISE33.3	Develop shell programming, communication, System calls and terminology.
21ISE33.4	Interpret Perl script commands for programming
21ISE33.5	Interpret tools for networking and security.

Textbooks:

1. **Unix Concepts and Applications**, Sumitabha Das, 4th Edition., Tata McGraw Hill

(Chapters 2.1 to 2.3, 2.5,2.6,2.8,2.9,2.11, 3.1-3.3,3.5,3.6,3.9 to 3.13, 4, 5.1 to 5.4,5.7-5.12,5.15 to 5.17, 6, 8, 11, 12, 13.1 to 13.3,14, 17.1 to 17.10, 18, 19.1 to 19.14,19.16,19.17.

Reference books:

1.**UNIX and Shell Programming**, Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning – India Edition, 2009.

2.**UNIX& Shell Programming**, M.G. Venkatesh Murthy, Pearson Education.

MOOCs:

1. https://www.coursera.org/learn/hands-on-introduction-to-linux-commands-and-shell-scripting
2. https://www.udemy.com/course/shellprogramming/
3. https://www.udemy.com/course/bash-shell-scripting-crash-course-for-beginners/
4. https://www.udacity.com/course/shell-workshop--ud206
5. https://www.udacity.com/course/linux-command-line-basics--ud595
6. https://www.edx.org/course/unix-tools-data-software-and-production-engineering
7. https://www.mygreatlearning.com/blog/shell-scripting-tutorial/
8. https://www.edureka.co/unix
9. https://www.unf.edu/~cwinton/html/cop3601/supplements/SoCUnixShellProg.html
10. https://onlinecourses.swayam2.ac.in/aic20_sp05/preview

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests for theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Lab CIE is conducted for 20 marks and is added to theory component.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test-3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE33.1	3	3	-	-	3	-	-	1	-	-	-	1	-	-	-	-
21ISE33.2	3	3	3	-	3	-	-	1	-	-	-	1	2	-	-	-
21ISE33.3	3	3	3	-	3	-	-	1	-	-	-	1	-	1	-	-
21ISE33.4	3	3	3	3	3	2	-	1	-	-	-	2	-	2	-	-
21ISE33.5	3	3	3	3	3	2	-	1	-	-	-	2	2	2	-	-
Average	3	3	3	3	3	2	-	1	-	-	-	1.4	2	1.66	-	-

Low-1: Medium-2: High-3

SEMESTER – III

Course: Computer Organization

Course Code	21ISE34	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Prerequisites:

Course Learning Objectives:

CLO1	Understand the basic sub systems of a computer, their organization, structure and operation.
CLO2	Illustrate organization of basic processing unit and different ways of communicating with I/O devices.
CLO3	Describe internal organization of memory and the concepts of cache memory.
CLO4	Interpret arithmetic and logical operations with integer and floating-point operands.

Content	No.of Hours/ RBT levels
Module 1 **Basic Structure of Computers:** Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. **Machine Instructions and Programs:** Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Additional Instructions	**8 Hours** **L2**
Module 2 **Input/output Organization:** Basic Input and Output Operations, Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts Handling Multiple Devices, Exceptions, Direct Memory Access, Buses.	**8 Hours** **L2**
Module 3 **Memory System:** Basic Concepts, Semiconductor RAM Memories – Internal organization of memory chips, Static memories, Asynchronous and synchronous DRAM, Structure of larger memories, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations – Hit rate and miss penalty	**8 Hours** **L2**
Module 4 **Arithmetic**: Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication- Bit-pair recoding of multipliers, Integer Division, Floating point Numbers and Operations.	**8 Hours** **L3**
Module 5 **Basic Processing Unit:** Some Fundamental Concepts, Execution of a Complete instruction, Multiple Bus Organization **Pipelining:** Basic Concepts, Data Hazards, Instruction Hazards	**8 Hours** **L2**

COURSE OUTCOMES:

CO's	Upon completion of this course, student will be able to:
21ISE34.1	Understand the basic structure of computers, machine instructions and addressing modes.
21ISE34.2	Illustrate the concept of interrupts and DMA.
21ISE34.3	Describe the internal organization of memory and the mapping of cache memory
21ISE34.4	Apply arithmetic operations on binary numbers at circuit level.
21ISE34.5	Illustrate the fundamentals of basic processing unit and Pipelining.

Textbooks:

1. Computer Organization- Carl Hamacher, ZvonkoVranesic, SafwatZaky:, 5th Edition, Tata McGraw Hill,2018.

Reference books:

1. Computer Organization & Architecture - William Stallings, 10th Edition, Pearson, 2016.

2. Advanced Computer Architecture Parallelism, Scalability – Kai Hwang, Programmability, Tata Mc Grawhill, 2017.

MOOCs

1. http://nptel.ac.in
2. https://www.khanacademy.org/
3. https://www.class-central.com (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component. CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests. Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs:

Seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
SEE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test- 3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE34.1	2	1	-	-	-	-	-	-	-	-	-	1	1	-	-	-
21ISE34.2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21ISE34.3	2	1	1	-	-	-	-	-	-	-	-	1	1	-	-	-
21ISE34.4	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
21ISE34.5	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	2	1	1	-	-	-	-	-	-	-	-	1	1	-	-	-

Low-1: Medium-2: High-3

SEMESTER – III

Course: Operating Systems

Course Code	21ISE35	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Basics of Computers

Course Learning Objectives

CLO1	Introduce concepts and terminology used in OS
CLO2	Illustrate process scheduling and synchronization with semaphores
CLO3	Illustrate the concept of deadlocks and memory management
CLO4	Explain Virtual memory management and file system
CLO5	Discuss secondary storage structure and its protection

Contents	No. of Hours RBT Level
Module 1 **Introduction to operating systems:** what operating systems do, Computer System organization, Computer System architecture, Operating System structure, Operating System operations, Process management, Memory management, Storage management, Security and Protection **operating 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	**08 Hours L2**
Module 2 **Process Management:** Process concept, Process scheduling, Operations on processes, inter process communication, IPC in Shared-Memory Systems, IPC in Message-Passing Systems. **Process Synchronization**: Background, The critical section problem, Peterson's solution, Semaphores	**08 Hours L3**
Module 3 **Deadlock:** Introduction to Deadlocks, System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection and recovery from deadlock **Mass-Storage Structure:** Overview, Storage Device Management, HDD Scheduling, Error Detection and Correction, NVM Scheduling, Swap-Space Management **File-System Interface:** File Concept, Access Methods, Directory Structure	**08 Hours L3**
Module 4 **Memory Management:** Memory management strategies, Background, Swapping, Contiguous memory allocation, Paging, Structure of page table, Segmentation. **Virtual Memory Management**: Background, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing.	**08 Hours L3**

Module 5	
Security: The Security Problem, Program Threats, System and Network Threats, User Authentication, Cryptography as a Security Tool **Protection:** Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix, Implementation of access matrix, Revocation of Access Rights , Role-Based Access Control	**08 Hours** **L2**

COURSE OUTCOMES

Upon completion of this course, student will be able to

21ISE35.1	Outline the fundamentals of operating system and its services
21ISE35.2	Apply Process Management & Synchronization concepts in real-time
21ISE35.3	Utilize Storage Management to solve real-time problem
21ISE35.4	Select appropriate Memory Management technique for a given problem
21ISE35.5	Explain various Security and Protection concepts of operating System

Text Books

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles, 10th edition, Wiley-India, 2012.

Reference Books

1. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
2. D.M Dhamdhere, Operating Systems, A Concept Based Approach 3rd Edition, McGraw- Hill, 2013.
3. P.C.P. Bhatt, An Introduction to Operating Systems, Concepts and Practice 4th Edition, PHI(EEE), 2014.
4. William Stallings Operating Systems, Internals and Design Principles, 6th Edition, Pearson

MOOCs (Format is given below)

1. http://nptel.ac.in
2. https://www.khanacademy.org/
3. https://www.class-central.com (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively
Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE35.1	3	-	-	-	-	-	-	-	-	-	-	3	-	2	-	-
21ISE35.2	3	2	2	2	-	-	-	-	-	-	-	3	3	2	-	-
21ISE35.3	3	2	2	2	-	-	-	-	-	-	-	3	3	2	-	-
21ISE35.4	3	2	2	2	-	-	-	-	-	-	-	3	3	2	-	-
21ISE35.5	3	2	2	2	-	-	-	-	-	-	-	3	3	2	-	-
Average	3	2	2	2	-	-	-	-	-	-	-	3	3	2	-	-

Low-1: Medium-2: High-3

SEMESTER – III/IV

Course: Constitution of India, Professional Ethics

Course Code	21CPH36	CIE Marks	100
Hours/Week (L: T: P)	1:0:0	SEE Marks	-
No. of Credits	01	Examination Hours	-

Course Learning Objectives:

CLO1	Know the fundamental political codes, structure, procedures, powers, and duties of Indian government institutions, fundamental rights, directive principles, and the duties of citizens.
CLO2	Understand engineering ethics and their responsibilities; identify their individual roles and ethical responsibilities towards society.
CLO3	Know about the cybercrimes and cyber laws for cyber safety measures.

Content	No. of Hours
Module 1 Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building.	**03 Hours**
Module 2 Union Executive and State Executive: Parliamentary System, Federal System, Centre-State Relations. Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism. State Executives – Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Special Provisions (Articles 370.371,371J) for some States.	**03 Hours**
Module 3 Elections, Amendments and Emergency Provisions: Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments - Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments – 7,9,10,12,42,44, 61, 73,74,75, 86, and 91,94,95,100,101,118 and some important Case Studies. Emergency Provisions, types of Emergencies and its consequences. Constitutional special provisions: Special Provisions for SC and ST, OBC, Women, Children and Backward Classes.	**03 Hours**

Module 4 Professional / Engineering Ethics: Scope & Aims of Engineering & Professional Ethics - Business Ethics, Corporate Ethics, Personal Ethics. Engineering and Professionalism, Positive and Negative Faces of Engineering Ethics, Code of Ethics as defined in the website of Institution of Engineers (India): Profession, Professionalism, and Professional Responsibility. Clash of Ethics, Conflicts of Interest. Responsibilities in Engineering Responsibilities in Engineering and Engineering Standards, the impediments to Responsibility. Trust and Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering	
Module 5 Internet Laws, Cyber Crimes and Cyber Laws: Internet and Need for Cyber Laws, Modes of Regulation of Internet, Types of cyber terror capability, Net neutrality, Types of Cyber Crimes, India and cyber law, Cyber Crimes and the information Technology Act 2000, Internet Censorship. Cybercrimes and enforcement agencies.	**03 Hours**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21CPH36.1	Have constitutional knowledge and legal literacy.
21CPH36.2	Understand Engineering and Professional ethics and responsibilities of Engineers.
21CPH36.3	Understand the cybercrimes and cyber laws for cyber safety measures.

TEXTBOOKS:

1. Constitution of India, Professional Ethics and Human,0 Shubham Singles, Charles E. Haries, and et. al., Cengage Learning India, 2018.
2. Cyber Security and Cyber Laws, Alfred Basta and et. al., Cengage Learning India, 2018

REFERENCE BOOKS:

1. Introduction to the Constitution of India, Durga Das Basu, Prentice –Hall, 2008.
2. Engineering Ethics, M. Govindarajan, S. Natarajan, V. S. Senthilkumar, Prentice –Hall, 2004

Scheme of Examination:

There is no Semester End Examination for this course. The assessment is based on Continuous Internal Evaluation only.

Continuous Internal Evaluation (CIE):

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests. Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. Typical Evaluation pattern for this course is shown in Table 2.

Table 2: Distribution of weightage for CIE

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**100**
	CIE Test-2	**40**	
	Quiz 1/AAT	**10**	
	Quiz 2/AAT	**10**	
Grand Total			**100**

CO/PO Mapping																
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21CPH36.1	-	-	-	-	-	3	-	3	1	-	-	3	-	-	-	-
21CPH36.2	-	-	-	-	-	3	-	3	1	-	-	3	-	-	-	-
21CPH36.3	-	-	-	-	-	3	-	3	1	-	-	3	-	-	-	-

Low-1: Medium-2: High-3

BE - **III/IV Semester – Common to all**

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ವಿಷಯ ಸಂಕೇತ (Course Code)	21KSK37/47	ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ ಅಂಕಗಳು	50
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ (Teaching Hours / Week (L:T:P: S)	0:2:0:1	ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು	50
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ Total Hours of Pedagogy	25 ಗಂಟೆಗಳು	ಒಟ್ಟು ಅಂಕಗಳು	100
ಕ್ರೆಡಿಟ್ಸ್ (Credits)	01	ಪರೀಕ್ಷೆಯ ಅವಧಿ	01 ಗಂಟೆ

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

1. ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಪರಿಚಯಿಸಿ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.
3. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
4. ಕನ್ನಡ ಶಬ್ದಸಂಪತ್ತಿನ ಪರಿಚಯ ಮತ್ತು ಕನ್ನಡ ಭಾಷೆಯ ಬಳಕೆ ಹಾಗೂ ಕನ್ನಡದಲ್ಲಿ ಪತ್ರ ವ್ಯವಹಾರವನ್ನು ತಿಳಿಸಿಕೊಡುವುದು.

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) :

These are sample Strategies, which teacher can use to accelerate the attainment of the course outcomes.

1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡವನ್ನು ಬೋಧಿಸಲು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಪ್ರಸ್ತುತ ಪುಸ್ತಕ ಆಧಾರಿಸಿ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನವನ್ನು ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಪ್ರೇರೇಪಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.
2. ಇತ್ತೀಚಿನ ತಂತ್ರಜ್ಞಾನದ ಅನುಕೂಲಗಳನ್ನು ಬಳಸಿಕೊಳ್ಳುವುದು - ಅಂದರೆ ಕವಿ-ಕಾವ್ಯ ಪರಿಚಯದಲ್ಲಿ ಕವಿಗಳ ಚಿತ್ರಣ ಮತ್ತು ಲೇಖನಗಳು ಮತ್ತು ಕಥೆ ಕಾವ್ಯಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟ ಧ್ವನಿ ಚಿತ್ರಗಳು, ಸಂಭಾಷಣೆಗಳು, ಈಗಾಗಲೇ ಇತರ ವಿಮರ್ಶಕರು ಬರೆದಿರುವ ವಿಮರ್ಶಾತ್ಮಕ ವಿಷಯಗಳನ್ನು ಟಿಪಿಟಿ, ಡಿಜಿಟಲ್ ಮಾಧ್ಯಮಗಳ ಮುಖಾಂತರ ವಿಶ್ಲೇಷಿಸುವುದು.
3. ನವೀನ ಮಾದರಿಯ ಸಾಹಿತ್ಯ ಬೋಧನೆಗೆ ಸಂಬಂಧಪಟ್ಟ ವಿಧಾನಗಳನ್ನು ಶಿಕ್ಷಕರು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಅನುಕೂಲವಾಗುವ ರೀತಿಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಬಹುದು.

ಘಟಕ -1 ಲೇಖನಗಳು

1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ
2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ
3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೋ. ವಿ. ಕೇಶವಮೂರ್ತಿ

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಘಟಕ -2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ	
1. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ. 2. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ - ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು 3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು - ಶಿಶುನಾಳ ಶರೀಫ	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.
ಘಟಕ -3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ	
1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಅಯ್ದ ಕೆಲವು ಭಾಗಗಳು 2. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ.ರಾ. ಬೇಂದ್ರೆ 3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.
ಘಟಕ -4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ	
1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ ಎನ್ ಮೂರ್ತಿರಾವ್ 2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.
ಘಟಕ -5 ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ	
1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ 2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಪರಿಣಾಮಗಳು (course Outcomes):

1. ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯವಾಗುತ್ತದೆ.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳು ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಆಸಕ್ತಿಯು ಮೂಡುತ್ತದೆ.
3. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.
4. ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.

ಮೌಲ್ಯಮಾಪನದ ವಿಧಾನ (Assessment Details- both CIE and SEE) :

(methods of CIE - MCQ, Quizzes, Open book test, Seminar or micro project)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and 35% marks in SEE to pass. Theory Semester End Exam (SEE) is conducted for 50 marks (01 hour duration). Based on this grading will be awarded.

Continuous Internal Evaluation:
Three Tests each of **20 Marks (duration 01 hour**)

a. First test at the end of 5th week of the semester
b. Second test at the end of the 10th week of the semester
c. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks : 1.** First assignment at the end of 4th week of the semester

2. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

3. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯು ಈ ಕೆಳಗಿನಂತಿರುತ್ತದೆ - Semester End Exam (SEE):

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.

1. The question paper will have 50 questions. Each question is set for 01 mark.

SEE Pattern will be in MCQ Model for 50 marks. Duration of the exam is 01 Hour.

ಪಠ್ಯಪುಸ್ತಕ :

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ಡಾ. ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ,

ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

BE - III / IV Semester – Common to All

ಬಳಕೆ ಕನ್ನಡ - baLake Kannada (Kannada for Usage)

ಕನ್ನಡ ಕಲಿಕೆಗಾಗಿ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಪುಸ್ತಕ - (Prescribed Textbook to Learn Kannada)

ವಿಷಯ ಸಂಕೇತ (Course Code)	**21KBK37/47**	ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ ಅಂಕಗಳು (Continuous Internal Evaluation Marks)	50
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ (Teaching Hours / Week (L:T:P: S)	0:2:0:1	ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು (Semester End Examination Marks)	50
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ Total Hours of Pedagogy	25 ಗಂಟೆಗಳು	ಒಟ್ಟು ಅಂಕಗಳು (Total Marks)	100
ಕ್ರೆಡಿಟ್ಸ್ (Credits)	01	ಪರೀಕ್ಷೆಯ ಅವಧಿ (Exam Hours)	01 ಗಂಟೆ

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು (Course Learning Objectives):

- To Create the awareness regarding the necessity of learning local language for comfortable and healthy life.
- To enable learners to Listen and understand the Kannada language properly.
- To speak, read and write Kannada language as per requirement.
- To train the learners for correct and polite conservation.

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) :

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. ಬಳಕೆ ಕನ್ನಡವನ್ನು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಬೋಧಿಸಲು ವಿಟಿಯು ಸೂಚಿಸಿರುವ ಪಠ್ಯಪುಸ್ತಕವನ್ನು ಉಪಯೋಗಿಸಬೇಕು.
2. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉತ್ತೇಜಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.
3. ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿ ಪುಸ್ತಕವನ್ನು ತರಗತಿಯಲ್ಲಿ ಬಳಸುವಂತೆ ನೋಡಿಕೊಳ್ಳುವುದು ಮತ್ತು ಪ್ರತಿ ಪಾಠ ಮತ್ತು ಪ್ರವಚನಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟಂತೆ ಪೂರಕ ಚಟುವಟಿಕೆಗಳಿಗೆ ತೊಡಗಿಸತಕ್ಕದ್ದು.
1. ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನದ ಮುಖಾಂತರ ಇತ್ತೀಚೆಗೆ ಡಿಜಿಟಲೀಕರಣ ಗೊಂಡಿರುವ ಭಾಷೆ ಕಲಿಕೆಯ ವಿಧಾನಗಳನ್ನು ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ಮುಖಾಂತರ ಚರ್ಚಿಸಲು ಕ್ರಮಕ್ಕೆಗೊಳ್ಳುವುದು. ಇದರಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ತರಗತಿಯಲ್ಲಿ ಹೆಚ್ಚು ಏಕಾಗ್ರತೆಯಿಂದ ಪಾಠ ಕೇಳಲು ಮತ್ತು ಅಧ್ಯಯನದಲ್ಲಿ ತೊಡಗಲು ಅನುಕೂಲವಾಗುತ್ತದೆ.
2. ಭಾಷಾಕಲಿಕೆಯ ಪ್ರಯೋಗಾಲಯದ ಮುಖಾಂತರ ಬಹುಬೇಗ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಕಲಿಯಲು ಅನುಕೂಲವಾಗುವಂತೆ ಕಾರ್ಯಚಟುವಟಿಕೆಗಳನ್ನು ಮತ್ತು ಕ್ರಿಯಾ ಯೋಜನೆಗಳನ್ನು ರೂಪಿಸುವುದು.

Module-1

1. Introduction, Necessity of learning a local language. Methods to learn the Kannada language.
2. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities
3. Key to Transcription.
4. ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸಾರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - **Personal Pronouns, Possessive Forms, Interrogative words**

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

Module-2

1. ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು - **Possessive forms of nouns, dubitive question and Relative nouns**
2. ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು **Qualitative, Quantitative and Colour Adjectives, Numerals**
3. **ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು – ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ – (ಆ, ಅದು, ಅವು, ಅಲ್ಲಿ) Predictive Forms, Locative Case**

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

Module-3

1. **ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು – Dative Cases, and Numerals**
4. **ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು – Ordinal numerals and Plural markers**
5. **ನ್ಯೂನ / ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು Defective / Negative Verbs and Colour Adjectives**

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

Module-4

1. ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತು ಒತ್ತಾಯ ಆರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು **Permission, Commands, encouraging and Urging words (Imperative words and sentences)**
2. ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು **Accusative Cases and Potential Forms used in General Communication**
3. "ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು - Helping Verbs "iru and iralla", Corresponding Future and Negation Verbs
6. ಹೋಲಿಕೆ (ತರತಮ) , ಸಂಬಂಧ ಸೂಚಕ ಮತ್ತು ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ- Comparitive, Relationship, Identification and Negation Words

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

Module-5

1. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು - ifferent types of forms of Tense, Time and Verbs
2. ದ್, -ತ್, - ತು, - ಇತು, - ಆಗಿ, - ಅಲ್ಲ, - ಗ್, -ಕ್, ಇದೆ, ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ - Formation of Past, Future and Present Tense Sentences with Verb Forms
3. **Kannada Vocabulary List :** ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು - **Kannada Words in Conversation**

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು: **course Outcomes (Course Skill** Set): At the end of the Course, The Students will be able

1. To understand the necessity of learning of local language for comfortable life.
2. To Listen and understand the Kannada language properly.
3. To speak, read and write Kannada language as per requirement.
4. To communicate (converse) in Kannada language in their daily life with kannada speakers.
5. To speak in polite conservation.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:

Three Tests each of **20 Marks (duration 01 hour**)

a. First test at the end of 5th week of the semester
b. Second test at the end of the 10th week of the semester
c. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks : 1.** First assignment at the end of 4th week of the semester

7. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

8. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯು ಈ ಕೆಳಗಿನಂತಿರುತ್ತದೆ - **Semester End Exam (SEE):**

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.

2. The question paper will have 50 questions. Each question is set for 01 mark.
3. SEE Pattern will be in MCQ Model for 50 marks. Duration of the exam is 01 Hour.

Textbook :

ಬಳಕೆ ಕನ್ನಡ

ಲೇಖಕರು : ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ

ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

SEMESTER – III

Course: Biology for Engineers

Semester:	**3**	**CIE Marks**	**50**
Course Code	**21ISE371**	**SEE Marks**	**50**
Hours/Week (L: T: P)	**1:0:0**	**Duration of SEE (hours):**	**3**
Type of Course	**AEC**	**Credits**	**1**

Course Learning Objectives:

Sl. No	Course Learning Objectives (CLO)
CLO1	Introduction to Basics of Biology which includes cell, the unit of life, Different types of cells and classification of living organisms.
CLO2	Understanding what are biomolecules present in a cell, their structure function and their role in a living organism. Application of certain bio molecules in Industry.
CLO3	Brief introduction to human physiology, which is essential for bioengineering field.
CLO4	How biology can be applied in our daily life using different technology, for production of medicines to transgenic plants and animals to designing new biotechnological products

Content	No. of Hours RBT Level
Module 1 **Introduction to Basic Biology:** Cell: What is a Cell, Cell theory, Cell shapes, structure of a Cell, Cell cycle chromosomes The Plant Cell and animal Cell, protoplasm, prokaryotic and eukaryotic Cell, Plant Tissue and Animal Tissue. Brief introduction to five kingdoms of classification.	**03 Hours** **L2**
Module 2 **Introduction to Bio-molecules:** Carbohydrates, proteins, Amino acid, nucleic acid (DNA and RNA) and their types. Enzymes and their application in Industry. Large scale production of enzymes by Fermentation.	**03 Hours** **L2**
Module 3 **Human Physiology:** Nutrition (Classes of nutrients or food substances), Digestive systems, Respiratory system (two kinds of respiration – aerobic and anaerobic) Respiratory organs, respiratory cycle. Excretory system	**03 Hours** **L2**

Module 4	
Application of Biology: Brief introduction to Production of vaccines, Enzymes, antibodies, Cloning in microbes, plants and animals, Basics of biosensors, biochips, Bio fuels, and Biosensors. What is Tissue engineering? And its application, transgenic plants and animals, Bio engineering (production of artificial limbs, joints and other parts of body).	**03 Hours** **L2**

Course Outcomes: Upon successful completion of this course, student will be able to

21ISE371.1	Explain different types of cells and basis for Classification of living organisms.
21ISE371.2	Explain about biomolecules structure and function, their role in a living organism and usefulness in Industry.
21ISE371.3	Explain different types of respiratory system
21ISE371.4	Identify the areas in real life where Biology can be implemented.

Reference Books:

1. Cell and Molecular Biology - P.K.Gupta
2. Cell Biology - Verma and Agarwal
3. Cell Biology - Rastogi
4. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2018.
5. T Johnson, Biology for Engineers, CRC press, 2011 Molecular Biology and Biotechnology 2nd ed. J.M. Walker and E.B. Gingold. Panima Publications. PP 434.

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE371.1	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21ISE371.2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21ISE371.3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21ISE371.4	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	**3**	**3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Low-1: Medium-2: High-3

SEMESTER – III

Course: Soft Skills and Relationships

Semester:	**3**	**CIE Marks**	**50**
Course Code	**21ISE372**	**SEE Marks**	**50**
Hours/Week (L: T: P)	**1:0:0**	**Duration of SEE (hours):**	**3**
Type of Course	**AEC**	**Credits**	**1**

Course Learning Objectives:

Sl. No	Course Learning Objectives (CLO)
CLO1	To introduce fundamentals of various aspects of personality traits.
CLO2	To expose students towards problem solving.
CLO3	To enable the students to develop time management skills
CLO4	To educate students about Interpersonal relationships.

Content	No. of Hours RBT Level
Module 1 **Soft Skills:** What are soft skills, Need for soft skills. **Introduction to Personality Development:** What is personality, types of personality, personality development, elements of personality development, SWOT Analysis, Goal Setting, Creativity.	**03 Hours** **L5**
Module 2 **Thinking Skills and problem Solving:** Core thinking skills, categories of thinking, need for problem solving, skills for problem solving, process of problem solving, stages of problem solving, methods of problems solving.	**03 Hours** **L5**
Module 3 **Time Management and Goal Setting:** Importance of time, techniques of time management, prioritization of activities, avoiding time wasters. Concept of goals, characteristics of goals, importance of goal setting, common obstacles to goal achievement, methods to achieve set goals.	**03 Hours** **L5**
Module 4 **Interpersonal relationships:** Importance of interpersonal relationship skills, types of interpersonal relationship skills, uses of interpersonal relationship skills, factors affecting interpersonal relationship skills, how to accommodate different styles, consequences of interpersonal relationships.	**03 Hours** **L5**

Course Outcomes: Upon successful completion of this course, student will be able to

21ISE372.1	Develop personality development techniques in terms of handling success and failure.
21ISE372.2	Develop core thinking skills along with problem solving capability.
21ISE372.3	Develop good time management skills along with goal setting
21ISE372.4	Develop interpersonal relationships.

Reference Books:

1. Barun K Mitra, "Personality Development and Soft Skills".
2. Manmohan Joshi, "Soft Skills".
3. Dale Carnegie, "How to Win Friends and Influence People"
4. Stephen R Covey, "The 7 Habits of Highly Effective People"
5. David Schwartz, "The Magic of Thinking Big"
6. Jeff Keller, "ATTITUDE is everything".
7. Joseph Murphy, "The Power of Subconscious Mind".

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21ISE372.1	-	-	-	-	-	-	-	3	3	-	-	3	-	-
21ISE372.2	-	-	-	-	-	-	-	3	3	-	-	3	-	-
21ISE372.3	-	-	-	-	-	-	-	3	3	-	-	3	-	-
21ISE372.4	-	-	-	-	-	-	-	3	3	-	-	3	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**-**	**-**

Low-1: Medium-2: High-3

SEMESTER – III

Course: Additional Mathematics

(For Lateral Entry students – Common to all branches)

Course Code	21MATDIP31	CIE Marks	50
Hours/Week (L: T: P)	2:2:0	SEE Marks	50
No. of Credits	00	Examination Hours	03

Course Learning Objectives: To enable students to apply the knowledge of Mathematics in various fields of engineering by making them to learn:

CLO1	Derivatives, Polar curves and Radius of curvature
CLO2	Partial Derivatives and Jacobians
CLO3	Multiple integrals, beta & gamma functions
CLO4	Ordinary and Partial differential equations

Content	No. of Hours/ RBT levels
Module 1 Successive differentiation - simple problems. Polar Curves - angle between radius vector and tangent, angle between two curves, Pedal equation. Taylor's and Maclaurin's series for function of one variable.	**8 Hours** **L2, L3**
Module 2 Evaluation of Indeterminate forms. Partial derivatives, Differentiation of implicit and composite functions. Jacobians. Taylor's series for functions of two variables.	**8 Hours** **L2, L3**
Module 3 Multiple Integrals-Double integrals- direct evaluation, change of order of integration, change of variables. Triple integrals-direct evaluation. Beta and Gamma functions, relation between beta and gamma function.	**8 Hours** **L2, L3**
Module 4 Solution of first order and first degree differential equations – Variable Separable, Exact and Bernoulli's differential equations. Second order linear differential equation with constant Coefficients-Inverse differential operators. Cauchy's and Legendre's Linear differential equations.	**8 Hours** **L2, L3**
Module 5 Formation of partial differential equations by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration, homogeneous PDEs involving derivative with respect to one independent variable only.	**8 Hours** **L2, L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21MATDIP31.1	Apply the knowledge of differential calculus to solve problems related to curvature, maxima & minima of a function and Jacobians
21MATDIP31.2	Evaluate double and triple integrals
21MATDIP31.3	Evaluate definite integrals using beta and gamma functions
21MATDIP31.4	Solve linear differential equations of first and second order with constant/variable coefficients
21MATDIP31.5	Solve partial differential equations.

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers 44th Edition, 2017
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill, 2006

Reference books:

1. E. Kreyszig , Advanced Engineering Mathematics, John Wiley & Sons 10th Edition, 2016
2. N.P.Bali and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications 6th Edition, 2014

Scheme of Examination:

Semester End Examination (SEE):

There will be no SEE examination for this course.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average of Marks scored in all three tests is added to test component. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs), and three tests.

Some possible AATs: seminar/assignments/ mini-projects/ concept videos/ partial reproduction of research work/ group activity/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

Component		Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Assignments	**10**	
Grand Total (Final CIE x 2)			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21MATDIP31.1	3	2	1	-	-	-	-	-	-	-	-	2	-	-	-	-
21MATDIP31.2	3	2	1	-	-	-	-	-	-	-	-	2	-	-	-	-
21MATDIP31.3	3	2	1	-	-	-	-	-	-	-	-	2	-	-	-	-
21MATDIP31.4	3	2	1	-	-	-	-	-	-	-	-	2	-	-	-	-
21MATDIP31.5	3	2	1	-	-	-	-	-	-	-	-	2	-	-	-	-
Average	3	2	1	-	-	-	-	-	-	-	-	2	-	-	-	-

Low-1: Medium-2: High-3

4th Semester Syllabus

SEMESTER – IV

Course: Discrete Mathematics – II

(Common for CSE/ISE/AI&DS/AIML)

Course Code	21MAT41A	CIE Marks	50
Hours/Week (L: T: P)	2:2:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Course Learning Objectives: To enable students to apply the knowledge of Mathematics in fields of computer science and allied branches by making them to learn:

CLO1	Relations and Functions
CLO2	Generating functions and Recurrence relations
CLO3	Groups and Subgroups
CLO4	Graph Theory

Content	No. of Hours/ RBT levels
Module 1 Relations and properties of relations, Representation of relations. Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions. Functions, Types of Functions, Function Composition and Inverse Functions.	**08 Hours** **L3**
Module 2 The Principle of Inclusion and Exclusion, Derangements, Rooks polynomials and arrangements with forbidden positions. Generating function and first order recurrence relation.	**08 Hours** **L3**
Module 3 Groups, subgroups, homomorphism, Isomorphism and cyclic groups. Cosets and Lagrange Theorem.	**08 Hours** **L3**
Module 4 Graphs, Subgraphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits. Planar Graphs, Hamiltonian paths and Cycles.	**08 Hours** **L3**
Module 5 Trees, Rooted Trees, Trees and Sorting, Weighted Trees and Prefix Codes. Dijkstra's Shortest Path Algorithm, Minimal Spanning Trees: The algorithms of Kruskal and Prim.	**08 Hours** **L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21MAT41A.1	Use computational techniques essential for the study of relations and functions, generating function, recurrence relations and groups.
21MAT41A.2	Solve problems using basic graph theory

Textbooks:

1. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education. 2020.

Reference books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, 6th Edition, McGraw Hill, 2007

Scheme of Examination:

Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of three sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average of Marks scored in all three tests is added to test component. CIE is executed by way of quizzes / Alternate Assessment Tools (AATs), and three tests. **Some possible AATs:** seminar/assignments/ mini-projects/ concept videos/ partial reproduction of research work/ group activity/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

Component		Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Assignments	**10**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21MAT41A.1	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-	-
21MAT41A.2	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-	-
Average	3	2	1	-	-	-	-	-	-	-	-	3	-	-	-	-

Low-1: Medium-2: High-3

SEMESTER –IV

Course: Design and Analysis of Algorithms using C (Integrated)

Course Code	21ISE42	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	4	Examination Hours	3

Prerequisites: C Programming and Data Structures

Course Learning Objectives:

CLO1	Apply different techniques used in algorithm analysis for solving computational problems.
CLO2	Design appropriate algorithm to solve problems on real world applications
CLO3	Understand different algorithm's design techniques and strategies.
CLO4	Analyze the efficiency of alternative algorithmic solutions for the same problem
CLO5	Apply appropriate data structures to enhance the performance of algorithms for problem solving

Content	No. of Hours/ RBT levels
Module 1 Basics of Algorithms Definition, Fundamentals of Algorithm and Problem Solving — Important Problem Types — Fundamentals of Algorithm Analysis and Efficiency, Time and Space Complexity. Analysis of Algorithm: The efficient algorithm, Average, Best and worst case analysis, Amortized analysis, Asymptotic Notations, Mathematical analysis of Non- Recursive and recursive Algorithms with Examples	**10 Hours L3**
Module 2 **Divide and Conquer Algorithm**: Introduction, Recurrence and different methods to solve recurrence. Problem Solving using divide and conquer algorithm - Binary Search, Max-Min problem, Sorting (Merge Sort, Quick Sort), Matrix Multiplication. **Exploring Graphs:** An introduction to graphs - Undirected Graph, Directed Graph, Traversing Graphs, Depth First Search, Breath First Search and Connected components**. Decrease and Conquer Approach:** Topological Sort.	**10 Hours L3**
Module 3 Greedy Algorithm General Characteristics of greedy algorithms, Problem solving using Greedy Algorithm - Elements of Greedy strategy, The Knapsack Problem, Job Scheduling Problem, Coin Change Problem, Huffman code. **Minimum Spanning** trees - Kruskal's algorithm and Prim's algorithm, **Single source shortest paths:** Dijkstra's Algorithm.	**10 Hours L3**

Module 4 **Dynamic Programming:** Introduction, The Principle of Optimality, Problem Solving using Dynamic Programming - Calculating the Binomial Coefficient, Making Change Problem, Assembly Line-Scheduling, Knapsack problem, **Transitive Closure**-Warshall's Algorithm, All Points Shortest path, Floyd's Algorithm, Optimal Binary Search Trees, Bellman-Ford Algorithm, Travelling Sales Person problem.	**10 Hours** **L3**
Module 5 **Backtracking and Branch and Bound:** Introduction, The N Queens problem, Knapsack problem, Travelling Salesman problem, Minimax principle. **Introduction to NP-Completeness:** The class P and NP, Polynomial reduction, NP- Completeness Problem, NP-Hard Problems. Travelling Salesman problem, Hamiltonian problem, Approximation algorithms.	**10 Hours** **L3**

Program List	
1	Sort a given set of ***n*** integer elements using **Selection Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000 and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate how brute force method works along with its time complexity analysis: worst case, average case and best case.
2	Sort a given set of ***n*** integer elements using **Merge Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000, and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
3	Implement in C, the **0/1 Knapsack** problem using (a) Greedy method. (b) Dynamic Programming method
4	From a given vertex in a weighted connected graph, find shortest paths to other vertices using **Dijkstra's algorithm**. Write the program in C.
5	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Kruskal's algorithm.**
6	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Prim's algorithm**.
7	Write C programs to implement **All-Pairs Shortest Paths problem** using **Floyd's algorithm**.
8	Write C programs to Implement **Travelling Salesmen Problem** using Dynamic programming.
9	Design and implement in C to find a **subset** of a given set **S** = {SI, S2,.....,Sn} of ***n*** positive integers whose SUM is equal to a given positive integer ***d***. For example, if S ={1, 2, 5, 6, 8} and ***d***= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.
10	Design and implement in C, **the Hamiltonian problem** and analyses for NP Completeness.

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE42.1	Demonstrate the Computational Complexity of Algorithms in terms of time and space
21ISE42.2	Devise algorithms using divide and conquer, decrease and conquer strategies for a given problem
21ISE42.3	Demonstrate Graph algorithms using greedy method, transform and conquer approach to model engineering problems
21ISE42.4	Solve the given problem using Dynamic Programming stratergy
21ISE42.5	Use Back Tracking, Branch and Bound algorithm design technique for solving computationally hard problems

Textbooks:

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin, 2rd Edition, 2019. Pearson.
2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press

Reference books:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 2nd Edition, PHI, 2006.
2. Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)

MOOCs:

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests for theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Lab CIE is conducted for 20 marks and is added to theory component.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test-3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE42.1	3	3	3	1	-	-	-	-	-	-	-	1	3	-	-	-
21ISE42.2	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
21ISE42.3	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
21ISE42.4	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
21ISE42.5	3	3	3	-	-	-	-	-	-	-	-	1	3	-	-	-
Average	3	3	3	1	-	-	-	-	-	-	-	1	3	-	-	-

Low-1: Medium-2: High-3

SEMESTER – IV

Course: Object Oriented Concepts using JAVA (Integrated)

Course Code	21ISE43	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	4	Examination Hours	3

Prerequisites: Programming in C

Course Learning Objectives:

Sl. No	Course Learning Objectives (CLO)
CLO1	Understand the object-oriented concepts in JAVA.
CLO2	Implement the concepts of control structures
CLO3	Discuss the concepts of Inheritance, Exceptions, Packages and Interfaces
CLO4	Demonstrate the concept of Multithreading and Wrapper classes
CLO5	Interpret the need for advanced Java concepts like generics and collections in developing modular and efficient programs

Content	No. of Hours/ RBT Level
Module 1 **Introduction to Java**: Java's magic: the Byte code; Java Development Kit (JDK); the Java Buzzwords, Object-oriented programming; Simple Java programs. Data types, variables and arrays, Operators, Control Statements. **Text book 1: Ch:1 Ch: 2 Ch:3 Ch:4 Ch:5**	**10 Hours L3**
Module 2 **Classes, Inheritance:** Classes: Classes fundamentals; Declaring objects; Constructors, this keyword, garbage collection. **Inheritance:** Inheritance basics, using super, creating multilevel hierarchy, method overriding and Abstract class. **Text book 1: Ch:6 Ch: 8**	**10 Hours L3**
Module 3 **Exceptions, Packages and Interfaces:** Exception handling in Java – try, catch, throw, throws, finally. Packages, Access Protection, Importing Packages, Interfaces. **Multi-Threaded Programming:** Multi-Threaded Programming: What are threads? How to make the classes threadable ; Extending threads; Implementing runnable; Synchronization; Interthread Communication - producer consumer problem. **Text book 1: Ch:10 Ch:9 Ch:11**	**10 Hours L3**

Module 4 **Type Wrappers:** Character, Boolean, Numeric type wrappers. Autoboxing: Autoboxing and Methods, Autoboxing / Unboxing occur in expressions, Autoboxing/Unboxing Boolean and Character values, Autoboxing / Unboxing helps prevents errors **String Handling:** String Constructors**,** Special string operations, character extraction, Comparison, Searching and Modifying of strings, Data Conversion, Changing the case of characters, Additional String Methods, String Buffer, String Builder **Text book 1: Ch:12 Ch:17**	**10 Hours** **L3**
Module 5 **Generics:** What are Generics, Simple Generics Example, A Generic Class with Two Parameters, General Form of Generic Class, Bounded Types, Wildcard Arguments, Generic Methods and Interfaces. **The Collections Framework:** Collections Overview, The Collection Interfaces – List, Set, The Collection Classes – ArrayList, LinkedList, HashSet **Text book 1: Ch:14 Ch:19**	**10 Hours** **L3**

Course Outcomes:

Upon successful completion of this course, student will be able to

21ISE43.1	Illustrate the fundamentals of Java Programming.
21ISE43.2	Implement object oriented concepts in Java.
21ISE43.3	Apply multithreading and interface concepts in Java application development.
21ISE43.4	Develop Java programs using wrapper classes and string handling methods.
21ISE43.5	Build applications using collection framework and generics to handle groups of objects effectively.

Text Books:

1. **Java the Complete Reference,** Herbert Schildt, 11th Edition, Tata McGraw Hill, 2020.

Reference Books:

1. **Starting Out with Java**: From Control Structures through Objects Tony Gaddis, Haywood Community College.—6th edition, Pearson Education.2017
2. **Big Java**: **Early Objects**, Cay S. Horstmann, 7th Edition, Wiley Publication.
3. **Advanced JAVA programming**, Uttam K Roy, Oxford University press, 2015.

<table>
<tr><th colspan="2">Possible List of Practical's</th><th>RBT Level</th></tr>
<tr><td>1.</td><td>Write Java programs
a. To print Fibonacci series without using recursion and using recursion.
b. To check prime numbers.
c. To sort an array elements using bubble sort algorithm.</td><td>L3</td></tr>
<tr><td>2.</td><td>
<table>
<tr><th>Object 1</th><th>Object 2</th><th>Winner</th></tr>
<tr><td>Rock</td><td>Rock</td><td>No winner (Tie)</td></tr>
<tr><td>Paper</td><td>Paper</td><td>No winner (Tie)</td></tr>
<tr><td>Scissors</td><td>Scissors</td><td>No winner (Tie)</td></tr>
<tr><td>Rock</td><td>Paper</td><td>Paper</td></tr>
<tr><td>Rock</td><td>Scissors</td><td>Rock</td></tr>
<tr><td>Paper</td><td>Scissors</td><td>Scissors</td></tr>
</table>
Write a Java program to create a simple rock, paper, scissors game. Here, a human is playing against the computer. Use random function to select one of the three items at both human and computer side. Scoring pattern is as below: Win: +10, Lose: -10, Tie: +5 each. The highest scorer is the winner. Play it for three trials and declare the winner after the third trial with appropriate message. If it is a tie even after the third trial, display "No Winner, No loser". Following table describes the game rule:</td><td>L3</td></tr>
<tr><td>3.</td><td>Create a class called account with the data members(Accno – integer, name String, Phone_No: integer, balance_amt:float), and following methods :
a. getInput() to get input from the user
b. Deposit () method which takes the amount to be deposited in to his/her account and do the calculation.
c. Withdraw () method which gets the amount to be withdrawn from his/her account.
d. Print the appropriate results.</td><td>L3</td></tr>
<tr><td>4.</td><td>Write a Java Program that does the following related to Inheritance:
a. Create an abstract class called Vehicle which contains the 'year_of_manufacture' data member and two abstract methods 'getData()' and 'putData()' with a constructor.
b. Create two derived classes "TwoWheeler" and "FourWheeler" and implement the abstract methods. Make "FourWheeler" as final class.
c. Create class 'MyTwoWheeler' which is a sub-class of "TwoWheeler" and demonstrate the use of super keyword to initialize data members of "MyTwoWheeler".</td><td>L3</td></tr>
<tr><td>5.</td><td>Write a Java Program that does the following
a. Create an interface Student which gets the name and branch of a student.
b. Create a package called 'StudentPackage' which has a user-defined class RegisterStudent.
c. If a student registers above 30 credits for the semester, the method should throw a user- defined exception called 'CreditLimit' and display an appropriate message.
d. Create another package called 'ResultPackage' which displays the grade for the subject registered for particular semester and the SGPA. If SGPA is above 10 then throws an Invalid SGPA user-defined exception.
e. In the StudentPackage, collect the marks of all the subjects in 4 semesters and calculate SGPA and CGPA.</td><td>L3</td></tr>
</table>

6.	Write a Java program to implement a Bounded Buffer producer-consumer. The bounded-buffer enables concurrent access to a shared resource. A bounded buffer lets multiple producers and multiple consumers share a single buffer. Producers write data to the buffer and consumers read data from the buffer. Producers must block if the buffer is full. Consumers must block if the buffer is empty.	**L3**
7.	Write a Java program to implement TwoSum. Given an array of integers, return the indices of two numbers such that they add up to a specific target. You may assume that each input would have exactly one solution, and you may not use the same element twice. Example. Given numbers = [2, 7, 11, 15], target = 9 Numbers[0] + numbers[1] = 2+ 7 = 9 Return [0, 1]	**L3**
8.	Write Java programs for the following a. To convert an integer to Roman numerals b. To convert Roman numeral to integer. Note: Consider the range of number to be up to 3000	**L3**
9.	Write a Java program to create a linked list of names (String type). Use an Iterator to traverse through the list and print those names whose length is < 5.	**L3**
10.	Write a Java program to fetch and return the details (studentId, studentName) of the students who have applied for revaluation in more than one subject using a HashSet. Student class should have the private members studentId, studentName and courseId.	**L3**

MOOCs:

1. Programming in java:https://nptel.ac.in/courses/106/105/106105191/
2. Java Tutorial for Complete Beginners: https://www.udemy.com/course/java-tutorial/
3. Core Java Specialization:https://www.coursera.org/specializations/core-java

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests for theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Lab CIE is conducted for 20 marks and is added to theory component.

Typical Evaluation pattern for regular courses is shown in Table 2.

	Components	Marks	Total
CIE	CIE TEST 1	**30**	**50**
	CIE TEST 2	**30**	
	CIE TEST 3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21ISE43.1	3	3	3	-	2	-	-	-	-	-	-	1	1	-
21ISE43.2	3	3	3	-	2	-	-	-	-	-	-	1	2	-
21ISE43.3	3	3	3	-	2	-	-	-	-	-	-	1	2	-
21ISE43.4	3	3	3	-	2	-	-	-	-	-	-	1	2	-
21ISE43.5	3	3	3	-	2	-	-	-	-	-	-	1	2	-
Average	3	3	3	1-	2	-	-	-	-	-	-	1	1.8	-

Low-1: Medium-2: High-3

SEMESTER –IV

Course: Data Communications

Course Code	21ISE44	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Course Learning Objectives:

CLO1	Understand the basic concepts of data communication, layered model, protocols and interworking between computer networks
CLO2	Discuss the fundamentals of analog and digital transmission techniques.
CLO3	Apply various Error Detection and Correction techniques in data link layer.
CLO4	Demonstrate Link Layer services and Medium Access Control protocols for reliable and noisy channels.
CLO5	Comprehend the working of wireless and wired LANs.

Content	No.of Hours/ RBT levels
Module 1 **Introduction** Data communications; Networks; Network types; Internet history; standards and administration; **Network Models** Protocol layering; TCP/IP Protocol suite; The OSI model	**08 Hours L2**
Module 2 **Introduction to physical layer** Data and signals ; Digital signals ; Transmission Impairment ; Data rate limits – Nyquist Bit Rate, Shannon Capacity; Performance.	**08Hours L3**
Module 3 **Digital Transmission**: Digital-to-Digital conversion – Line coding, Line coding schemes; Analog-to-Digital conversion - PCM. Digital to Analog conversion: Amplitude shift keying, Frequency shift keying;, Phase shift keying, quadrature amplitude modulation; **Error detection & correction**: Introduction; Block coding; Cyclic codes – CRC, Polynomials; Checksum	**08 Hours L3**
Module 4 **Datalink control**: DLC services; DLL protocols; Point-to-Point Protocol – Framing, transition phases **Media Access control(MAC)**: Random Access ;Controlled Access ; Channelization	**08 Hours L2**
Module 5 **Wired LANs:** Ethernet protocol; Standard Ethernet; Wireless LANs: IEEE 802.11 PROJECT Architecture, MAC sublayer, addressing mechanism; Bluetooth; **Other Wireless Networks:** Cellular Telephony	**08 Hours L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE44.1	Explain the fundamentals of data communication
21ISE44.2	Apply analog and digital conversion techniques for data transmission
21ISE44.1	Demonstrate Error Detection and Correction in the transmission of data.
21ISE44.1	Describe the fundamentals of Data Link Control and Medium Access Control layers.
21ISE44.1	Outline the basics of Wired and Wireless LANs.

Textbooks:

1. Data Communications and Networking, Behrouz A. Forouzan, , Fifth Edition, Tata McGraw-Hill, 2017.

Reference books:

1. Communication Networks –Fundamental Concepts and Key architectures, Alberto LeonGarcia and Indra Widjaja, , Second Edition, Tata McGraw-Hill, 2004.
2. Data Communications and Networking, Wayne Tomasi, Introduction to, Pearson Education, 2005

MOOCs:

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs:

seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical evaluation pattern for regular courses is shown in Table 1:

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE44.1	3	-	-	-	-	1	-	1	-	-	-	1	-	3	-	-
21ISE44.2	3	3	3	3	-	1	-	1	-	-	-	1	1	3	-	-
21ISE44.3	3	3	3	3	-	1	-	1	-	-	-	1	1		-	3
21ISE44.4	3	3	3	3	-	1	-	1	-	-	-	1	-	3	-	-
21ISE44.5	3	-	-	-	-	1	-	1	-	-	-	1	-	3	-	1
Average	3	3	3	3	-	1	-	1	-	-	-	1	1	3	-	2

Low-1: Medium-2: High-3

SEMESTER – IV

Course: Software Engineering and Agile Methodologies

Course Code	21ISE45	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Prerequisites: General awareness of the software/project development.

Course Learning Objectives:

CLO1	Outline software engineering principles and processes involved in building software by following professional and ethical laws.
CLO2	To gain knowledge of the development of software projects by applying phases of SDLC.
CLO3	Outline the various levels of software evaluation and software evolution to meet the changes.
CLO4	Identify software quality parameters, schedule of project activities.
CLO5	Recognize the need for agile practices in software development.

Content	No.of Hours/ RBT levels
Module 1 **Introduction**: Software Crisis, Need for Software Engineering, Professional Software Development, Software Engineering Ethics, Case Studies. **Software Processes**: Models: Waterfall Model, Incremental Model and Spiral Model. Process activities. **Requirements Engineering:** Requirements Engineering Processes, Requirements Elicitation and Analysis, Functional and non-functional requirements, The software Requirements Document, Requirements Specification, Requirements validation and management.	**08 Hours L2**
Module 2 **System Models:** Context models, Interaction models, Structural models, Behavioural models. **Design and Implementation**: Introduction to RUP, Design Principles, Object-oriented design using the UML, Implementation issues.	**08 Hours L2**

Module 3 **Software Testing**: Development testing, Test-driven development, Release testing, User testing. **Software Evolution:** Evolution processes, Program evolution dynamics, Software maintenance, Legacy system management	**08 Hours L2**
Module 4 **Project Planning**: Software pricing, Plan-driven development, Project scheduling Estimation techniques (Introduction to COCOMO model) **Quality management**: Software quality, Reviews and inspections, Software standards	**08 Hours L2**
Module 5 **Agile Software Development**: Coping with Change, The Agile Manifesto: Values and Principles. Agile methods: SCRUM (Ref "The SCRUM Primer, Ver2.0") and Extreme Programming, Plan-driven and agile development , Agile project management, Scaling agile methods	**08 Hours L2**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE45.1	Understand the principles of software engineering process and its phases.
21ISE45.2	Outline the nature of software systems based on process and system models.
21ISE45.3	Explain the software testing and evolution processes.
21ISE45.4	Demonstrate project planning process and quality management.
21ISE45.5	Discuss software practices in agile methodology.

Textbooks:

1. **Software Engineering**, Ian Sommerville, 9th Edition, Pearson Education, 2017. (Listed topics only from Chapters 1,2,3,4, 5, 7, 8, 9, 23, and 24)

2. The SCRUM Primer, Ver 2.0, http://www.goodagile.com/scrumprimer/scrumprimer20.pdf

Reference books:

1. Software Engineering-A Practitioners Approach, Roger S. Pressman, 7th Edition, Tata McGraw Hill.
2. An Integrated Approach to Software Engineering, Pankaj Jalote:, Wiley India

Scheme of Examination:
Semester End Examination (SEE):SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs:
seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test- 3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping															
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE45.1	3	3	3	-	-	2	2	3	1	1	-	2	3	2	-	-
21ISE45.2	3	3	3	-	1	2	2	3	1	1	-	2	3	2	-	-
21ISE45.3	3	3	2	-	1	2	2	2	1	1	-	2	3	2	-	-
21ISE45.4	3	3	2	-	-	1	1	1	1	1	2	2	3	2	-	-
21ISE45.5	3	3	3	-	2	1	1	1	1	1	1	2	3	2	-	-
Average	3	3	2.6	-	1.3	1.6	1.6	2	1	1	1.5	2	3	2	-	-

Low-1: Medium-2: High-3

SEMESTER – III/IV

Course: Constitution of India, Professional Ethics

Course Code	21CPH46	CIE Marks	100
Hours/Week (L: T: P)	1:0:0	SEE Marks	-
No. of Credits	01	Examination Hours	-

Course Leaning Objectives:

CLO1	Know the fundamental political codes, structure, procedures, powers, and duties of Indian government institutions, fundamental rights, directive principles, and the duties of citizens.
CLO2	Understand engineering ethics and their responsibilities; identify their individual roles and ethical responsibilities towards society.
CLO3	Know about the cybercrimes and cyber laws for cyber safety measures.

Content	No. of Hours
Module 1 Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building.	**03 Hours**
Module 2 Union Executive and State Executive: Parliamentary System, Federal System, Centre-State Relations. Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism. State Executives – Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Special Provisions (Articles 370.371,371J) for some States.	**03 Hours**

Module 3 Elections, Amendments and Emergency Provisions: Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments - Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments – 7,9,10,12,42,44, 61, 73,74,75, 86, and 91,94,95,100,101,118 and some important Case Studies. Emergency Provisions, types of Emergencies and its consequences. Constitutional special provisions: Special Provisions for SC and ST, OBC, Women, Children and Backward Classes.	**03 Hours**
Module 4 Professional / Engineering Ethics: Scope & Aims of Engineering & Professional Ethics - Business Ethics, Corporate Ethics, Personal Ethics. Engineering and Professionalism, Positive and Negative Faces of Engineering Ethics, Code of Ethics as defined in the website of Institution of Engineers (India): Profession, Professionalism, and Professional Responsibility. Clash of Ethics, Conflicts of Interest. Responsibilities in Engineering Responsibilities in Engineering and Engineering Standards, the impediments to Responsibility. Trust and Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.	**03 Hours**
Module 5 Internet Laws, Cyber Crimes and Cyber Laws: Internet and Need for Cyber Laws, Modes of Regulation of Internet, Types of cyber terror capability, Net neutrality, Types of Cyber Crimes, India and cyber law, Cyber Crimes and the information Technology Act 2000, Internet Censorship. Cybercrimes and enforcement agencies.	**03 Hours**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21CPH46.1	Have constitutional knowledge and legal literacy.
21CPH46.2	Understand Engineering and Professional ethics and responsibilities of Engineers.
21CPH46.3	Understand the cybercrimes and cyber laws for cyber safety measures.

TEXTBOOKS:

1. Constitution of India, Professional Ethics and Human,0 Shubham Singles, Charles E. Haries, and et. al., Cengage Learning India, 2018.
2. Cyber Security and Cyber Laws, Alfred Basta and et. al., Cengage Learning India, 2018

REFERENCE BOOKS:

1. Introduction to the Constitution of India, Durga Das Basu, Prentice –Hall, 2008.
2. Engineering Ethics, M. Govindarajan, S. Natarajan, V. S. Senthilkumar, Prentice –Hall, 2004

Scheme of Examination:

There is no Semester End Examination for this course. The assessment is based on Continuous Internal Evaluation only.

Continuous Internal Evaluation (CIE):

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests. Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. Typical Evaluation pattern for this course is shown in Table 2.

Table 2: Distribution of weightage for CIE

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**100**
	CIE Test-2	**40**	
	Quiz 1/AAT	**10**	
	Quiz 2/AAT	**10**	
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21CPH46.1	-	-	-	-	-	3	-	3	1	-	-	3	-	-	-	-
21CPH46.2	-	-	-	-	-	3	-	3	1	-	-	3	-	-	-	-
21CPH46.3	-	-	-	-	-	3	-	3	1	-	-	3	-	-	-	-

Low-1: Medium-2: High-3

BE - **III/IV Semester – Common to all**

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ವಿಷಯ ಸಂಕೇತ (Course Code)	21KSK37/47	ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ ಅಂಕಗಳು	50
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ (Teaching Hours / Week (L:T:P: S)	0:2:0:1	ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು	50
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ Total Hours of Pedagogy	25 ಗಂಟೆಗಳು	ಒಟ್ಟು ಅಂಕಗಳು	100
ಕ್ರೆಡಿಟ್ಸ್ (Credits)	01	ಪರೀಕ್ಷೆಯ ಅವಧಿ	01 ಗಂಟೆ

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

1. ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಪರಿಚಯಿಸಿ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.
3. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
4. ಕನ್ನಡ ಶಬ್ದಸಂಪತ್ತಿನ ಪರಿಚಯ ಮತ್ತು ಕನ್ನಡ ಭಾಷೆಯ ಬಳಕೆ ಹಾಗೂ ಕನ್ನಡದಲ್ಲಿ ಪತ್ರ ವ್ಯವಹಾರವನ್ನು ತಿಳಿಸಿಕೊಡುವುದು.

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) :

These are sample Strategies, which teacher can use to accelerate the attainment of the course outcomes.

1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡವನ್ನು ಬೋಧಿಸಲು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಪ್ರಸ್ತುತ ಪುಸ್ತಕ ಆಧಾರಿಸಿ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನವನ್ನು ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಪ್ರೇರೇಪಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.
2. ಇತ್ತೀಚಿನ ತಂತ್ರಜ್ಞಾನದ ಅನುಕೂಲಗಳನ್ನು ಬಳಸಿಕೊಳ್ಳುವುದು - ಅಂದರೆ ಕವಿ-ಕಾವ್ಯ ಪರಿಚಯದಲ್ಲಿ ಕವಿಗಳ ಚಿತ್ರಣ ಮತ್ತು ಲೇಖನಗಳು ಮತ್ತು ಕಥೆ ಕಾವ್ಯಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟ ಧ್ವನಿ ಚಿತ್ರಗಳು, ಸಂಭಾಷಣೆಗಳು, ಈಗಾಗಲೇ ಇತರ ವಿಮರ್ಶಕರು ಬರೆದಿರುವ ವಿಮರ್ಶಾತ್ಮಕ ವಿಷಯಗಳನ್ನು ಟಿಪಿಟಿ, ಡಿಜಿಟಲ್ ಮಾಧ್ಯಮಗಳ ಮುಖಾಂತರ ವಿಶ್ಲೇಷಿಸುವುದು.
3. ನವೀನ ಮಾದರಿಯ ಸಾಹಿತ್ಯ ಬೋಧನೆಗೆ ಸಂಬಂಧಪಟ್ಟ ವಿಧಾನಗಳನ್ನು ಶಿಕ್ಷಕರು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಅನುಕೂಲವಾಗುವ ರೀತಿಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಬಹುದು.

ಘಟಕ -1 ಲೇಖನಗಳು

1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ
2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ
3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೋ. ವಿ. ಕೇಶವಮೂರ್ತಿ

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಘಟಕ -2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ	
1. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ. 2. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ - ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು 3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು - ಶಿಶುನಾಳ ಶರೀಫ	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.
ಘಟಕ -3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ	
1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಅಯ್ದ ಕೆಲವು ಭಾಗಗಳು 2. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ.ರಾ. ಬೇಂದ್ರೆ 3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.
ಘಟಕ -4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ	
1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ ಎನ್ ಮೂರ್ತಿರಾವ್ 2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.
ಘಟಕ -5 ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ	
1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ 2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ	
ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಪರಿಣಾಮಗಳು (course Outcomes):

1. ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯವಾಗುತ್ತದೆ.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳು ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಆಸಕ್ತಿಯು ಮೂಡುತ್ತದೆ.
3. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.
4. ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.

ಮೌಲ್ಯಮಾಪನದ ವಿಧಾನ (Assessment Details- both CIE and SEE) :

(methods of CIE - MCQ, Quizzes, Open book test, Seminar or micro project)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and 35% marks in SEE to pass. Theory Semester End Exam (SEE) is conducted for 50 marks (01 hour duration). Based on this grading will be awarded.

Continuous Internal Evaluation:
Three Tests each of **20 Marks (duration 01 hour**)

a. First test at the end of 5th week of the semester
b. Second test at the end of the 10th week of the semester
c. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks : 1.** First assignment at the end of 4th week of the semester

2. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

3. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯು ಈ ಕೆಳಗಿನಂತಿರುತ್ತದೆ - Semester End Exam (SEE):

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.

1. The question paper will have 50 questions. Each question is set for 01 mark.

SEE Pattern will be in MCQ Model for 50 marks. Duration of the exam is 01 Hour.

ಪಠ್ಯಪುಸ್ತಕ :

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ಡಾ. ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ,

ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

ಬಳಕೆ ಕನ್ನಡ - baLake Kannada (Kannada for Usage)

ಕನ್ನಡ ಕಲಿಕೆಗಾಗಿ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಪುಸ್ತಕ - (Prescribed Textbook to Learn Kannada)

ವಿಷಯ ಸಂಕೇತ (Course Code)	**21KBK37/47**	ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ ಅಂಕಗಳು (Continuous Internal Evaluation Marks)	50
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ (Teaching Hours / Week (L:T:P: S)	0:2:0:1	ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು (Semester End Examination Marks)	50
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ Total Hours of Pedagogy	25 ಗಂಟೆಗಳು	ಒಟ್ಟು ಅಂಕಗಳು (Total Marks)	100
ಕ್ರೆಡಿಟ್ಸ್ (Credits)	01	ಪರೀಕ್ಷೆಯ ಅವಧಿ (Exam Hours)	01 ಗಂಟೆ

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು (Course Learning Objectives):

- To Create the awareness regarding the necessity of learning local language for comfortable and healthy life.
- To enable learners to Listen and understand the Kannada language properly.
- To speak, read and write Kannada language as per requirement.
- To train the learners for correct and polite conservation.

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) :

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. ಬಳಕೆ ಕನ್ನಡವನ್ನು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಬೋಧಿಸಲು ವಿಟಿಯು ಸೂಚಿಸಿರುವ ಪಠ್ಯಪುಸ್ತಕವನ್ನು ಉಪಯೋಗಿಸಬೇಕು.
2. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉತ್ತೇಜಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.
3. ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿ ಪುಸ್ತಕವನ್ನು ತರಗತಿಯಲ್ಲಿ ಬಳಸುವಂತೆ ನೋಡಿಕೊಳ್ಳುವುದು ಮತ್ತು ಪ್ರತಿ ಪಾಠ ಮತ್ತು ಪ್ರವಚನಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟಂತೆ ಪೂರಕ ಚಟುವಟಿಕೆಗಳಿಗೆ ತೊಡಗಿಸತಕ್ಕದ್ದು.
1. ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನದ ಮುಖಾಂತರ ಇತ್ತೀಚೆಗೆ ಡಿಜಿಟಲೀಕರಣ ಗೊಂಡಿರುವ ಭಾಷೆ ಕಲಿಕೆಯ ವಿಧಾನಗಳನ್ನು ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ಮುಖಾಂತರ ಚರ್ಚಿಸಲು ಕ್ರಮಕ್ಕೆಗೊಳ್ಳುವುದು. ಇದರಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ತರಗತಿಯಲ್ಲಿ ಹೆಚ್ಚು ಏಕಾಗ್ರತೆಯಿಂದ ಪಾಠ ಕೇಳಲು ಮತ್ತು ಅಧ್ಯಯನದಲ್ಲಿ ತೊಡಗಲು ಅನುಕೂಲವಾಗುತ್ತದೆ.
2. ಭಾಷಾಕಲಿಕೆಯ ಪ್ರಯೋಗಾಲಯದ ಮುಖಾಂತರ ಬಹುಬೇಗ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಕಲಿಯಲು ಅನುಕೂಲವಾಗುವಂತೆ ಕಾರ್ಯಚಟುವಟಿಕೆಗಳನ್ನು ಮತ್ತು ಕ್ರಿಯಾ ಯೋಜನೆಗಳನ್ನು ರೂಪಿಸುವುದು.

Module-1

1. Introduction, Necessity of learning a local language. Methods to learn the Kannada language.
2. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities
3. Key to Transcription.
4. ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸಾರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - **Personal Pronouns, Possessive Forms, Interrogative words**

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

Module-2

1. ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು - **Possessive forms of nouns, dubitive question and Relative nouns**
2. ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು **Qualitative, Quantitative and Colour Adjectives, Numerals**
3. **ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು – ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ – (ಆ, ಅದು, ಅವು, ಅಲ್ಲಿ) Predictive Forms, Locative Case**

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

Module-3

1. **ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು – Dative Cases, and Numerals**
4. **ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು – Ordinal numerals and Plural markers**
5. **ನ್ಯೂನ / ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು Defective / Negative Verbs and Colour Adjectives**

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

Module-4

1. ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತು ಒತ್ತಾಯ ಆರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು **Permission, Commands, encouraging and Urging words (Imperative words and sentences)**
2. ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು **Accusative Cases and Potential Forms used in General Communication**
3. "ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು - Helping Verbs "iru and iralla", Corresponding Future and Negation Verbs
6. ಹೋಲಿಕೆ (ತರತಮ) , ಸಂಬಂಧ ಸೂಚಕ ಮತ್ತು ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ- Comparitive, Relationship, Identification and Negation Words

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

Module-5

1. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು - ifferent types of forms of Tense, Time and Verbs
2. ದ್, -ತ್, - ತು, - ಇತು, - ಆಗಿ, - ಅಲ್ಲ, - ಗ್, -ಕ್, ಇದೆ, ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ - Formation of Past, Future and Present Tense Sentences with Verb Forms
3. **Kannada Vocabulary List :** ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು - **Kannada Words in Conversation**

ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವಿಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಖಾಂತರ ಚರ್ಚಿಸುವುದು.

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು: **course Outcomes (Course Skill** Set): At the end of the Course, The Students will be able

1. To understand the necessity of learning of local language for comfortable life.
2. To Listen and understand the Kannada language properly.
3. To speak, read and write Kannada language as per requirement.
4. To communicate (converse) in Kannada language in their daily life with kannada speakers.
5. To speak in polite conservation.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:

Three Tests each of **20 Marks (duration 01 hour**)

a. First test at the end of 5th week of the semester
b. Second test at the end of the 10th week of the semester
c. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks : 1.** First assignment at the end of 4th week of the semester

7. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**)

8. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯು ಈ ಕೆಳಗಿನಂತಿರುತ್ತದೆ - **Semester End Exam (SEE):**

SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject.

2. The question paper will have 50 questions. Each question is set for 01 mark.
3. SEE Pattern will be in MCQ Model for 50 marks. Duration of the exam is 01 Hour.

Textbook :

ಬಳಕೆ ಕನ್ನಡ

ಲೇಖಕರು : ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ

ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

Semester – IV

Course: Environmental Studies

Semester:	**4**	**CIE Marks**	**50**
Course Code	**21ISE471**	**SEE Marks**	**50**
Hours/Week (L: T: P)	**1:0:0**	**Duration of SEE (hours):**	**3**
Type of Course	**AEC**	**Credits**	**1**

Course Learning Objectives:

CLO1	To create and disseminate knowledge to the students about environment
CLO2	To sensitize students towards environmental concerns, issues, and impacts.
CLO3	To make the students to apply their knowledge for efficient environmental decision-making, management and sustainable development.
CLO4	To prepare students for successful career in environmental departments, research institutes, industries, consultancy and NGOs, etc.

Module 1	**No. of Hours** **RBT Level**
The Environment: The Atmosphere, Hydrosphere, Lithosphere, Biosphere, Ecology, Ecosystem, Biogeochemical Cycle (Carbon Cycle, Nitrogen Cycle), Environment Pollution: Air Pollution, Water Pollution, Soil Pollution, Radiation Pollution.	**03 Hours** **L2**
Module 2	
Population Ecology: Individuals, Species, Pollution, Community, Control Methods of Population, Urbanization and its effects on Society, Communicable Diseases and its Transmission, Non-Communicable Diseases.	**03 Hours** **L2**
Module 3	
Environmental Movements in India: Grass root Environmental movements in India, State Pollution Control Board, Central Pollution Control Board	**03 Hours** **L2**
Module 4	
Natural Resources: Conservation of Natural Resources, Management and Conservation of Wildlife, Soil Erosion and Conservation, Environmental Laws: Water Act, 1974, Air Act, 1981, The Wildlife (Protection) Act, 1972, Environment Protection, 1986, Natural Disasters and their Management.	**03 hours** **L2**

Course Outcomes: Upon successful completion of this course, student will be able to

21ISE471.1	Acquire fundamental knowledge of different aspects of environment and pollution.
21ISE471.2	Explain urbanization along with communicable and non-communicable diseases.
21ISE471.3	Explain Environmental Movements in India:
21ISE471.4	Understand the various laws of environment.

Reference Books:

1. Dash MC and Mishrs PC, Man and Environment, McMillan, London.
2. Mishra PC and Das MC, Environment and Society, McMillan, London.
3. Odeem EP, Fundamentals of Ecology, Natraj Publication.
4. Mishra DD, Fundamental Concept in Environmental Studies, S.Chand, New Delhi.
5. Asthana DK and Asthana Meera, A Testbook of Environmental Studies, S. Chand, New Delhi.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE471.1	-	3	-	-	-	3	3	-	-	-	-	3	-	-	-	-
21ISE471.2	-	3	-	-	-	3	3	-	-	-	-	3	-	-	-	-
21ISE471.3	-	3	-	-	-	3	3	-	-	-	-	3	-	-	-	-
21ISE471.4	-	3	-	-	-	3	3	-	-	-	-	3	-	-	-	-
Average	**-**	**3**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**

Low-1: Medium-2: High-3

SEMESTER – IV

Course: Personality Development

Semester:	**4**	**CIE Marks**	**50**
Course Code	**21ISE472**	**SEE Marks**	**50**
Hours/Week (L: T: P)	**1:0:0**	**Duration of SEE (hours):**	**3**
Type of Course	**AEC**	**Credits**	**1**

Course Learning Objectives:

Sl. No	Course Learning Objectives (CLO)
CLO1	To introduce fundamentals of various aspects of personality traits.
CLO2	To expose students to right attitudinal and behavioral aspects
CLO3	To enable the students to develop humble nature
CLO4	To enable students to develop decision making and time management skills

Module 1	**No. of Hours** **RBT Level**
Introduction to Personality Development: The concept of personality - Dimensions of personality – Theories of Freud & Erickson-Significance of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure. SWOT analysis.	**03 Hours** **L3**
Module 2	
Attitude & Motivation Attitude: Concept - Significance - Factors affecting attitudes - Positive attitude – Advantages –Negative attitude- Disadvantages - Ways to develop positive attitude - Differences between personalities having positive and negative attitude. Concept of motivation - Significance – Internal and external motives - Importance of self- motivation- Factors leading to de-motivation	**03 Hours** **L3**
Module 3	
Self-esteem: Term self-esteem - Symptoms - Advantages - Do's and Don'ts to develop positive self-esteem – Low self-esteem - Symptoms - Personality having low self-esteem - Positive and negative self-esteem. Interpersonal Relationships – Defining the difference between aggressive, submissive and assertive behaviours - Lateral thinking.	**03 Hours** **L3**
Module 4	
Other Aspects of Personality Development: Body language - Problem-solving - Conflict and Stress Management - Decision-making skills - Leadership and qualities of a successful leader – Character building -Team-work – Time management - Work ethics – Good manners and etiquette.	**03 Hours** **L3**

Course Outcomes: Upon successful completion of this course, student will be able to

21ISE472.1	Develop personality development techniques in terms of handling success and failure.
21ISE472.2	Develop a positive attitude which is the result of a disciplined and deliberate way of seeing, thinking, and responding to life.
21ISE472.3	Develop humble nature
21ISE472.4	Develop decision making and time management skills

Reference Books:

1. Norman Vincent Peale, "The Power of Positive Thinking".
2. Dale Carnegie, "How to Win Friends and Influence People"
3. Stephen R Covey, "The 7 Habits of Highly Effective People"
4. David Schwartz, "The Magic of Thinking Big"
5. Jeff Keller, "ATTITUDE is Everything".
6. Jospeh Murphy, "The Power of Subconscious Mind".

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE472.1	-	-	-	-	-	-	-	3	3	3	3	3	-	-	-	-
21ISE472.2	-	-	-	-	-	-	-	3	3	3	3	3	-	-	-	-
21ISE472.3	-	-	-	-	-	-	-	3	3	3	3	3	-	-	-	-
21ISE472.4	-	-	-	-	-	-	-	3	3	3	3	3	-	-	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**

Low-1: Medium-2: High-3

5th Semester Syllabus

SEMESTER – V

Course: Theory of Computations

Course Code	21ISE51	CIE Marks	50
Hours/Week (L: T: P)	2:2:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Set theory, mathematical induction, functions relations, elements of mathematical reasoning, and proof techniques.

Course Learning Objectives:

CLO1	Explain the core concepts in Automata and Theory of Computation
CLO2	Identify different Formal language Classes and their Relationships
CLO3	Design Grammars and Recognizers for different formal languages
CLO4	Identify theorems in automata theory using their properties
CLO5	Determine the decidability and intractability of Computational problems

Content	No.of Hours/ RBT levels
Module 1 **Introduction to Finite Automata:** Introduction to Finite Automata; The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata.	**08 Hours L3**
Module 2 **Regular Expressions:** An application of finite automata; Finite automata with Epsilon-transitions; Regular expressions; Finite Automata and Regular Expressions; Applications of Regular Expressions. **Regular Languages, Properties of Regular Languages:** Regular languages; Proving languages not to be regular languages; Closure properties of regular languages; Decision properties of regular languages; Equivalence and minimization of automata.	**08Hours L3**
Module 3 **Grammars and Languages:** Context –free grammars; Parse trees; Applications; Ambiguity in grammars and Languages. Pushdown Automata: Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA‟s and CFG‟s; Deterministic Pushdown Automata.	**08 Hours L3**
Module 4 **Context-Free Languages:** Normal forms for CFGs; The pumping lemma for CFGs; Closure properties of CFLs. **Turing Machines:** Turing machine model, Representation, Language acceptability by TM, design of TM, Techniques for TM construction.	**08 Hours L3**

Module 5	
Types of Turing machine: Variants of Turing Machines (TM), The model of Linear Bounded automata. **Decidability:** Definition of an algorithm, decidability, decidable languages, Undecidable languages, halting problem of TM, Post correspondence problem. Complexity: Growth rate of functions, the classes of P and NP, Quantum Computation: quantum computers, Church Turing thesis.	**08 Hours** **L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE51.1	Choose different combinatorial methods to design computational models.
21ISE51.2	Apply formal mathematical methods to prove properties of languages, grammars, and automata.
21ISE51.3	Interpret various algorithms used for restricted machine models of computation.
21ISE51.4	Identify limitations of computational models and suggest possible methods of improving the same.
21ISE51.5	Distinguish between decidability and undecidability languages of Turing machine

Textbooks:

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, 7)
2. K L P Mishra, N Chandrasekaran , 3rd Edition, Theory of Computer Science, PHI, 2012. (Chapters 9.1 to 9.8, 10.1 to 10.7, 12.1, 12.2, 12.8, 12.8.1, 12.8).

Reference books:

1. Introduction to Languages and the Theory of Computation, John C Martin, TMH.
2. A Text book on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
3. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan, Rama R, Pearson.

MOOCs:
http://nptel.iitm.ac.in/

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs:

seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE51.1	3	3	3	3	-	-	-	-	-	-	-	2	2	2	-	-
21ISE51.2	3	3	3	3	-	-	-	-	-	-	-	2	2	2	-	-
21ISE51.3	3	3	3	3	-	-	-	-	-	-	-	2	2	2	-	-
21ISE51.4	3	3	3	3	-	-	-	-	-	-	-	2	2	2	-	-
21ISE51.5	3	3	3	3	-	-	-	-	-	-	-	2	2	2	-	-
Average	3	3	3	3	-	-	-	-	-	-	-	2	2	2	-	-

Low-1: Medium-2: High-3

SEMESTER V

Course: Database Management Systems (Integrated)

Course Code	21ISE52	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	4	Examination Hours	03

Course Learning Objectives: Basic knowledge of Computer Science and Database

CLO1	To understand the concept of DBMS and ER Modeling.
CLO2	To explain the normalization, query optimization and relational algebra.
CLO3	To apply the concurrency control, recovery, security and indexing for the real time data.

Content	No.of Hours/ RBT levels
Module 1 **Fundamental Concepts and Architecture** Introduction to database system, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of using the DBMS Approach, Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence. **Conceptual Database Design** High-Level Conceptual Data Models for Database Design, Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, ER Diagrams, Naming Conventions, and Design Issues, Relationship Types of Degree Higher than Two	**10 Hours L3**
Module 2 **Relational Database Design** Relational Model Constraints, Update Operations, dealing with Constraint Violations, Relational Algebra, Unary Relational Operations: Operations from Set Theory, Binary Relational Operations, Additional Relational Operations, Database Design Using ER-to-Relational Mapping **SQL** SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL. **Complex queries, Triggers, Views and Schema Modification.** More Complex SQL Retrieval Queries, Specifying Constraints as Assertions and Actions as Triggers, Views (Virtual Tables) in SQL, Schema Change Statements in SQL.	**10 Hours L3**

Module 3 **Normalization Theory** Informal Design Guidelines for Relation Schemas, Functional Dependencies, Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Normal Forms Based on Primary Keys, Boyce-Codd Normal Form	**10 Hours L3**
Module 4 **Transaction Processing** Translating SQL Queries into Relational Algebra - heuristic query optimization – cost based query optimization. Introduction to Transaction Processing - Transaction and System concepts – Desirable properties of Transactions-Characterizing schedules based on recoverability -Characterizing schedules based on Serializability.	**10 Hours L3**
Module 5 **NoSQL Database Management** Introduction, Need of NoSQL, CAP Theorem, different NoSQL data models: Key-value stores, Column families, Document databases, Graph databases	**10 Hours L3**

Program List	
Railway Reservation System -(Redesigning IRCTC database) **Train**(train Number, name, source, destination,start_time, reach_time, traveltime, distance, class, days, type) **Ticket**(PNRNo,Transactionid, from_station, To_station, date_of_journey, class date_of_booking, total_ticket_fare,train number) **Passenger**(PNR No, Serial no, Name, Age, Reservation_status) **Train_Route**(Train_No, route_no, station_code, name, arrival_time,depart_time, distance,day) **Train_Ticket_fare**(Train_No, class, base_fare, reservation_charge, superfast_charge, other_charge, tatkal_charge, service_tax)	
1	Create all the tables specified above. Make underlined columns as primary key.(use number, number(m,n), varchar(n), date, time, timestamp datatypes appropriately) Insert atleast 5 rows to each table. (Check www.irctc.co.in website for actual data) 1. Use Interactive insertion for inserting rows to the table. 2. Use ADT(varray) for class and days column in Train table.
2	Write simple DDL/DML Queries to 1. Remove all the rows from Passenger table permanently. 2. Change the name of the Passenger table to PassengerDetails. 3. List all train details. 4. List all passenger details. 5. Give a list of trains in ascending order of number. 6. List the senior citizen passengers details. 7. List the station names where code starts with 'M'.

	8. List the trains details within a range of numbers. 9. Change the super fast charge value in train fare as zero, if it is null. 10. List the passenger names whose tickets are not confirmed. 11. List the base_fare of all AC coaches available in each train. Find the ticket details where transaction id is not known. 1) Use Interactive updation for updating the seat no for particular PNR NO. 2) Find the train names that are from Chennai to Mumbai, but do not have the source or destination in its name. 3) Find the train details that are on Thursday (Use the ADT column created).
3	Create (Alter table to add constraint) the necessary foreign keys by identifying the relationships in the table. 1) Add a suitable constraint to train table to always have train no in the range 10001 to 99999. 2) Add a suitable constraint for the column of station name, so that does not take duplicates. 3) Change the data type of arrival time, depart time (date -> timestamp or timestamp to date), and do the necessary process for updating the table with new values. 4) Add a suitable constraint for the class column that it should take values only as 1A, 2A, 3A, SL, C. 5) Add a not null constraint for the column distance in train_route.
4	Use SQL functions to. 1. Find the passengers whose date of journey is one month from today. 2. Print the train names in upper case. 3. Print the passenger names with left padding character. 4. Print the station codes replacing K with M. 5. Translate all the LC in class column (Train_fare) to POT and display. 6. Display the fare details of all trains, if any value is ZERO, print as NULL value. 7. Display the pnrno and transaction id, if transaction id is null, print 'not generated'. 8. Print the date_of_jounrney in the format '27th November 2010'. 9. Find the maximum fare (total fare). 10. Find the average age of passengers in one ticket. 11. Find the maximum length of station name available in the database. 12. Print the fare amount of the passengers as rounded value.
5	Write Queries to. Use SET Operators 1. Find the train numbers for which reservation have not yet been made. 2. Find the train names that donot have a first AC class coach. 3. Print all the PNR nos available in the database. 4. Find passenger names who have booked to 'Pune'. Use Nested Query(in Operators) 1. Find the train names that stop in 'Mysore'. 2. Find the train names that are superfast and the service tax is zero. 3. Find the Passenger name who have booked for the train that starts from 'Chennai'. 4. Find the trains names that have all the AC coaches and the base fare is less than 3000 for each case Use Join Query 1. Find the train names that stop in 'Mysore'. 2. Find the train names that are superfast and the service tax is zero. 3. Find the Passenger name (and train name) who have booked for the train that starts from 'Chennai'. 4. Display the trains names, each type of class and the total fare for each type of class.

	5. Display all the train details and the ticket details(if booked any). 6. Create a sequence to provide values for the PNR no. 7. Write a query for full outer join using any of the tables above.
6	Write Queries to. Use Coorelated (and nested) Query 1. Find the train names for which ten tickets have been reserved. 2. Find the trains that have more than ten substations. 3. Find the passengers who do not pass through 'Mettupalam'. 4. Find passengers who have booked for super fast trains. Complex queries(use groupby/groupby having/join/nested) 1. Take the start station code and end station code and display the train details. 2. List the train names and the number of sub stations it has. 3. List the stations where all types of trains stop. 4. List the trains names that has atleast four bookings. 5. Create a table cancellation history(Insert values from ticket and passenger table). 6. Create a table for all the train numbers and class available in train_ticket_fare with total seats. 7. Find the station name that has highest number of trains stopping at.
7	Write a Trigger for the following: 1. When a passenger cancels a ticket, do the necessary process and update the cancellation history table. 2. When train number is changed, update it in referencing tables. 3. When a passenger record is inserted reservation status should be automatically updated.
8	1. Use TCL commands for your transactions. (commit,rollback,savepoint) 2. Create a role named 'clerk', and give permission for him to select only the trains starting from 'Katpadi' along with fare details. 3. Create a nested table containing trainno, name,source,destination and passengers who have booked for it (PNR no,sno, name,age). Find the passengers whose name start with 'S' and train starts from 'Katpadi'

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE52.1	Design entity relationship diagrams to represent simple database application scenarios.
21ISE52.2	Illustrate the design principles for database design, SQL and normalization.
21ISE52.3	Apply Concurrency control and recovery mechanisms for the desirable database problem.
21ISE52.4	Demonstrate the basics of database storage structure and access techniques, query evaluation and heuristic query optimization techniques.
21ISE52.5	Review the fundamental view on unstructured data and its management.

Textbooks:

1.Fundamentals of Database Systems **,**RamezElmasri and ShamkantB.Navathe, Pearson Education,7th edition, 2013

Reference books:

1. Database Management Systems, Raghu Rama Krishnan, Tata Mcgraw Hill,6th edition,2010.
2. Database System Concepts, Abraham Silberschatz, Henry F.Korth and S.Sudarshan, Tata Mc Graw
Hill, 6th edition, 2011.

MOOCs

1. http://nptel.ac.in
2. https://www.khanacademy.org/
3. https://www.class-central.com
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests for theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Lab CIE is conducted for 20 marks and is added to theory component.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test- 3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE52.1	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-
21ISE52.2	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-
21ISE52.3	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-
21ISE52.4	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-
21ISE52.5	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-
Average	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Computer Networks (Integrated)

Course Code	21ISE53	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	4	Examination Hours	4

Prerequisites: Data Communications

Course Learning Objectives:

CLO1	Demonstration of application layer protocols
CLO2	Comprehend the concepts of data mining for decision making Discuss transport layer services and understand UDP and TCP protocols
CLO3	Explain the working of regression model on the given data set
CLO4	Understand clustering model on the given data set.
CLO5	Understand business intelligence for various applications using marketing

Content	No.of Hours/ RBT levels
Module 1 **Application Layer:** Principles of Network Applications: Network Application Architectures, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols. The Web and HTTP: Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, User-Server Interaction: Cookies, Web Caching, The Conditional GET, File Transfer: FTP Commands & Replies, Electronic Mail in the Internet: SMTP, Comparison with HTTP, Mail Message Format, Mail Access Protocols, DNS; The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages	**10 Hours L2**
Module 2 **Transport Layer:** Introduction and Transport-Layer Services: Overview of the Transport Layer in the Internet,: Connectionless Transport: UDP, UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer: Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N, Selective repeat, Connection-Oriented Transport TCP: The TCP Connection, TCP Segment Structure, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control: The Causes and the Costs of Congestion, Approaches to Congestion Control, TCP Congestion Control: Fairness.	**10 Hours L3**
Module 3 **The Network layer:** What's Inside a Router?: Input Processing, Switching, Output Processing. The Internet Protocol: datagram format, IPv4 addressing, ICMP, IPv6, Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm.	**10 Hours L3**

Module 4 **Network Security:** Overview of Network Security: Elements of Network Security, Classification of Network Attacks, Security Methods, Symmetric-Key Cryptography: Data Encryption Standard (DES), Advanced Encryption Standard (AES), Public-Key Cryptography: RSA Algorithm, Diffie-Hellman Key-Exchange Protocol, Authentication: Hash Function, Secure Hash Algorithm (SHA), Digital Signatures, Firewalls and Packet Filtering, Packet Filtering, Proxy Server.	**10 Hours L3**
Module 5 **Wireless and Mobile Networks**: Cellular Internet Access: An Overview of Cellular Network Architecture, 3G Cellular Data Networks: Extending the Internet to Cellular subscribers, On to 4G: LTE, Mobility management: Principles, Addressing, Routing to a mobile node, Mobile IP, Managing mobility in cellular Networks, Routing calls to a Mobile user, Handoffs in GSM	**10 Hours L3**

Program List	
1	Ring Topology and Bus Topology
2	Three node point to point network
3	Ethernet LAN using n-nodes with multiple traffic
4	Operation of Stop and wait Protocol
5	Simple ESS with wireless LAN
6	Error detection using CRC-CCITT
7	Determination of shortest path using Bellman-Ford algorithm
8	Congestion control using Leaky bucket concept
9	Encryption and Decryption of data using RSA
10	Client/ Server Communication using TCP/ IP Socket

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE53.1	Understand principles of application layer protocols
21ISE53.2	Explain transport layer UDP and TCP protocols services
21ISE53.3	Summarize Internet Protocol and network layer routing algorithms
21ISE53.4	Understand different network security algorithms.
21ISE53.5	Discuss the wireless and mobile network covering IEEE 802.11 standard

Textbooks:

1. **James F Kurose and Keith W Ross**, Computer Networking, A Top-Down Approach, Sixth edition, Pearson, 2017.

Reference books:

1. Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian Edition
2. Larry L Peterson and Brusce S Davie, Computer Networks, fifth edition, ELSEVIER
3. Andrew S Tanenbaum, Computer Networks, fifth edition, Pearson
4. Mayank Dave, Computer Networks, Second edition, Cengage Learning

E-Books / Web References:

1. https://eclass.teicrete.gr/modules/document/file.php/TP326/%CE%98%CE%B5%CF%89%CF%81%CE%AF%CE%B1%20(Lectures)/Computer_Networking_A_Top-Down_Approach.pdf
2. http://eti2506.elimu.net/Introduction/Books/Data%20Communications%20and%20Networking%20By%20Behrouz%20A.Forouzan.pdf

MOOCs:

1. https://www.my-mooc.com/en/mooc/computer-networking--ud436/
2. https://www.udacity.com/course/computer-networking--ud436
3. https://onlinecourses.swayam2.ac.in/cec19_cs07/preview

Scheme of Examination:
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):
Three Tests for **theory** component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Lab CIE is conducted for 20 marks and is added to theory component.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test- 3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE53.1	1	-	-	-	1	1	-	-	1	1	-	3	1	-	1	-
21ISE53.2	1	-	-	-	2	1	-	-	1	1	-	3	1	-	1	-
21ISE53.3	2	2	1	1	2	1	-	-	1	1	-	3	1	1	2	2
21ISE53.4	1	-	-	-	-	1	-	-	1	1	-	3	1	-	1	-
21ISE53.5	1	-	-	-	-	1	-	-	1	1	-	3	1	-	1	-
Average	1	2	1	1	2	1	-	-	1	1	-	3	1	1	1	2

Low-1: Medium-2: High-3

SEMESTER – V

Course: Introduction to Artificial Intelligence

Course Code	21ISE541	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Prerequisites: Basics of Computers

Course Learning Objectives:

CLO1	Identify the problems where AI is required and the different methods available
CLO2	Compare and contrast different AI techniques available.
CLO3	Define and explain learning algorithms

Content	No.of Hours/ RBT levels
Module 1 **Introduction**: What is artificial intelligence? Problems, problem spaces and search, Heuristic search technique	**08 Hours L2**
Module 2 **Knowledge Representation**: Knowledge Representation Issues, Using Predicate Logic, Representing knowledge using Rules	**08Hours L2**
Module 3 **Reasoning**: Symbolic Reasoning under Uncertainty, Statistical reasoning, Weak Slot and Filter Structures.	**08 Hours L2**
Module 4 **Game Playing:** Strong slot-and-filler structures, Game Playing.	**08 Hours L2**
Module 5 **Expert Systems**: Natural Language Processing, Learning, Expert Systems.	**08 Hours L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE541.1	Identify problems that can be solved by AI methods
21ISE541.2	Explain the way of representation of knowledge
21ISE541.3	Illustrate and solve problems with uncertain information using different approaches
21ISE541.4	Develop algorithms using strong-filler structures and game playing.
21ISE541.5	Interpret natural language processing, various learning techniques and expert systems

Textbooks:

1. E. Rich, K. Knight & S. B. Nair - Artificial Intelligence, 3/e, McGraw Hill.

Reference books:

1. Artificial Intelligence: A Modern Approach, Stuart Rusell, Peter Norving, Pearson Education 2nd Edition.
2. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems – Prentice Hal of India.
3. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem Solving", Fourth Edition, Pearson Education, 2002.
4. Artificial Intelligence and Expert Systems Development by D W Rolston-Mc Graw hill.
5. N.P. Padhy "Artificial Intelligence and Intelligent Systems" , Oxford University Press-2015

MOOCs:

1. https://www.coursera.org/lecture/ibm-exploratory-data-analysis-for-machine-learning/introduction-to-artificial-intelligence-and-machine-learning-DMVcd
2. https://nptel.ac.in/courses/106/105/106105077/

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE541.1	2	2	-	-	-	-	-	-	-	-	-	1	2	-	-	-
21ISE541.2	2	2	2	-	-	-	-	-	-	-	-	1	2	-	-	-
21ISE541.3	2	2	2	-	-	-	-	-	-	-	-	1	2	-	-	-
21ISE541.4	2	2	2	-	-	-	-	-	-	-	-	1	2	-	-	-
21ISE541.5	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**	**-**	**-**
Average																

Low-1: Medium-2: High-3

SEMESTER – V

Course: Data Mining

Course Code	21ISE542	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Course Learning Objectives:

CLO1	Understand data mining challenges and various data mining Tasks.
CLO2	Explain rules related to association, classification and clustering analysis.
CLO3	Compare and contrast between different classification and clustering algorithms
CLO4	To characterize the kinds of patterns that can be discovered by association rule mining, and Anomaly Detection.

Content	No.of Hours/ RBT levels
Module 1: Introduction **Introduction**: What is data mining, Motivating Challenges, The origin of Data Mining, Data Mining Tasks, **Data**: Types of Data, Data Quality, Data Preprocessing, Measures of Similarity and Dissimilarity. **Textbook 1: Ch.1.1,1.2,1.3, 1.4, 2.1 to 2.4**	**08 Hours L2**
Module 2: Classification **Classification:** Decision Trees Induction, Method for Comparing Classifiers, Rule Based Classifiers, Nearest Neighbor Classifiers, Bayesian Classifiers, Artificial Neural Network (ANN), Support Vector Machine (SVM) **Textbook 1: Ch 4.3,4.6,5.1,5.2,5.3,5.4,5.5**	**08Hours L3**
Module 3: Association Analysis **Association Analysis:** Problem Definition, Frequent Item set Generation, Rule generation. Compact Representation of Frequent Itemset, Alternative Methods for Generating Frequent Item sets, FP- Growth Algorithm, Evaluation of Association Patterns. **Textbook 1: Ch 6.1 to 6.7**	**08 Hours L3**
Module 4: Clustering Analysis **Clustering Analysis:** Overview, K-Means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Cluster Analysis: Characteristics of Data, Clusters and Clustering Algorithms, prototype-Based Clustering, Density-Based Clustering, Graph-Based Clustering, Scalable Clustering Algorithms. **Textbook 1: Ch 8.1 to 8.5, 9.1 to 9.5**	**08 Hours L3**

Module 5: Anomaly Detection	
Anomaly Detection: Preliminaries, Statistical Approaches, Proximity-Based Outliers Detection, Density-Based Outlier Detection, Clustering-based Techniques. **Textbook 1: Ch 10.1 to 10.5**	**08 Hours L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE542.1	Understand the functionality of the various data mining concepts.
21ISE542.2	Apply different classifiers to solve data analysis problems.
21ISE542.3	Apply association rules for generating data pattern.
21ISE542.4	Apply clustering algorithms for solving data mining problems.
21ISE542.5	Apply Anomaly Detection algorithms for solving data mining problems.

Textbooks:

1. "Introduction to Data Mining", Pang-Ning Tan, Vipin Kumar, Michael Steinbach, Pearson Publication, 1st Impression, 2014.
2. Jiawei Han, Micheline Kamber, Jian Pei: Data Mining -Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publisher, 2012.

Reference books:

1. "Insight in Data Mining – Theory and Practical", K. P. Soman, Shyam Diwakar, V. Ajay, Eastern Economy Edition, 7th Printing, 2014.
2. "Machine Learning using R", Karthik Ramasubramaniam, Abhishek Singh, Apress Publishing, 2017.
3. Zaki MJ & Wagner M JR, "Data Mining and Analysis-Fundamental Concepts and Algorithms",Cambridge Univ Press, 2014.
4. Michael.J.Berry,Gordon.S.Linoff: Mastering Data Mining , Wiley Edition, second edtion,2012.

MOOCs

1. https://nptel.ac.in/courses/106105174
2. https://www.mygreatlearning.com/academy/learn-for-free/courses/data-mining1
3. https://www.coursera.org/specializations/data-mining
4. https://www.edx.org/learn/data-mining

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE542.1	3	3	2	-	3	-	-	2	-	1	-	2	2	-	-	-
21ISE542.2	3	3	2	-	3	-	-	2	-	1	-	2	2	-	-	-
21ISE542.3	3	3	2	-	3	-	-	2	-	1	-	2	2	-	-	-
21ISE542.4	3	3	2	-	3	-	-	2	-	1	-	2	2	-	-	-
21ISE542.5	3	3	2	-	3	-	-	2	-	1	-	2	2	-	-	-
Average	3	3	2	-	3	-	-	2	-	1	-	2	2	-	-	-

Low-1: Medium-2: High-3

SEMESTER – V

Course: Computer Graphics

Course Code	21ISE543	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3 hrs

Prerequisites: Programming Languages-C, Python

Course Learning Objectives:

CLO1	To understand computer graphics fundamentals
CLO2	To become familiar with raster technology for enabling users to interact with popular I/O devices.
CLO3	To represent 2D/3D geometric objects and apply transformations, viewing techniques, lighting and shading effects.
CLO4	Familiarity with standard rasterization algorithms.

Content	No.of Hours/ RBT levels
Module 1 Computer Graphics: Basics of computer graphics, Application of Computer Graphics, Video Display Devices: Random Scan and Raster Scan displays, color CRT monitors, Flat panel displays. Raster-scan systems: video controller, raster scan Display processor, graphics workstations and viewing systems, Input devices, graphics networks, graphics on the internet, graphics software.	**08 Hours L3**
Module 2 Fill area Primitives: Polygon fill-areas, fill area attributes, general scan line polygon fill algorithm. 2D Geometric Transformations: Basic 2D Geometric Transformations, matrix representations and homogeneous coordinates. Inverse transformations, 2D Composite transformations, other 2D transformations, raster methods for geometric transformations	**08 Hours L3**
Module 3 3D Geometric Transformations: 3D translation, rotation, scaling, composite 3D transformations, other 3D transformations, affine transformations. Colour Models: Properties of light, colour models, RGB and CMY colour models. Illumination Models: Light sources, basic illumination models-Ambient light, diffuse reflection, specular and Phong model.	**08 Hours L3**
Module 4 Clipping, window, normalization and viewport transformations, clipping algorithms, 2D point clipping, 2D line clipping algorithms: Cohen-Sutherland line clipping only -polygon fill area clipping: Sutherland-Hodgeman polygon clipping algorithm.	**08 Hours L3**

Module 5	
3D Viewing: 3D viewing concepts, 3D viewing pipeline, 3D viewing coordinate parameters, Transformation from world to viewing coordinates, Projection transformation, orthogonal projections, perspective projections, The viewport transformation and 3D screen coordinates. Curved surfaces, Quadric surfaces and Cubic-Surface, Bezier Spline Curves, Bezier surfaces.	**08 Hours L3**

Course Outcomes:
Upon successful completion of this course, student will be able to

21ISE543.1	Understand the fundamentals of computer graphics
21ISE543.2	Demonstrate the concepts of Fill area Primitives and 2D Geometric Transformations
21ISE543.3	Demonstrate the 3D Geometric Transformations and Color/Illumination models
21ISE543.4	Apply the concepts of clipping on window and viewport transformations
21ISE543.5	Understand the concepts of 3D Viewing, Projection transformation and Curved Surfaces

Text Books:

1. Donald Hearn & Pauline Baker: Computer Graphics with OpenGL Version,3rd/ 4thEdition, Pearson Education,2011

Reference Books:

1. James D Foley, Andries Van Dam, Steven K Feiner, John F Huges Computer graphics with OpenGL: pearson education
2. Xiang, Plastock : Computer Graphics , Sham's outline series, 2nd edition, TMG.
3. Kelvin Sung, Peter Shirley, Steven Baer: Interactive Computer Graphics, concepts and applications, Cengage Learning

E-Books / Web References

1. http://www.freebookcentre.net/ComputerScience-Books-Download/Computer-Graphics-Lecture-Notes-by-MIT.html
2. Computer Graphics from Scratch, A Programmer's Introduction to 3D Rendering (Kindle Edition) ,
3. Books by Gabriel Gambetta: https://www.amazon.com/dp/B085BVJG5B?tag=uuid10-20

MOOCs

1. https://www.udemy.com/course/computer-graphics/
2. https://www.courses.com/indian-institute-of-technology-madras/computer-graphics
3. https://www.youtube.com/watch?v=fwzYuhduME4&list=PL338D19C40D6D1732&index=2
4. https://www.youtube.com/watch?v=0ZuSu44- WeE&list=PL338D19C40D6D1732&index=3
5. https://www.youtube.com/watch?v=0plNDJj4UPY&list=PL338D19C40D6D1732&index=21
6. https://www.youtube.com/watch?v=apxdcHwBcZY&list=PL338D19C40D6D1732&index=40
7. E-learning: www.vtu.ac.in

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE543.1	3	3	3	-	3	-	-	-	-	-	-	-	3	-	-	-
21ISE543.2	3	3	3	-	3	-	-	-	-	-	-	-	3	-	-	-
21ISE543.3	3	3	3	-	3	-	-	-	-	-	-	-	3	-	-	-
21ISE543.4	3	3	3	-	3	-	-	-	-	-	-	-	3	-	-	-
21ISE543.5	3	3	3	-	3	-	-	-	-	-	-	-	3	-	-	-
Average	3	3	3	-	3	-	-	-	-	-	-	-	3	-	-	-

Low-1: Medium-2: High-3

SEMESTER – V

Course: Cloud Computing

Course Code	21ISE544	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Prerequisites: Computer Networks

Course Learning Objectives:

CLO1	Illustrate the core concepts of the cloud computing paradigm and reference models
CLO2	Discuss system virtualization and outline its role in enabling the cloud computing system model.
CLO3	Learn the key and enabling technologies that help in the development of cloud.
CLO4	Be able to install and use current cloud technologies

Content	No. of Hours/ RBT levels
Module 1 **Introduction:** Defining Cloud Computing, Cloud Types, Examining the Characteristics of Cloud Computing Historical Developments, Virtualization, Introduction, Characteristics of Virtualized Environments, Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualizations, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples: VMware: Full Virtualization	**08 Hours** **L2**
Module 2 **Cloud Computing Architecture:** Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Definition, Cloud Interoperability and Standards Scalability and Fault Tolerance Security, Trust, and Privacy Organizational Aspects, Aneka application framework overview	**08Hours** **L3**
Module 3 **Cloud Computing and Big Data:** Introduction to Bigdata, Characteristics, Cloud computing role for Bigdata, Data Intensive Computing, Map-Reduce Programming, Characterizing Data-Intensive Computations, Challenges Ahead, Technologies for Data-Intensive Computing, Storage Systems, Introducing the MapReduce Programming Model.	**08 Hours** **L3**
Module 4 **Cloud Computing Software Security Fundamentals:** Cloud Information Security Objectives, Cloud Security Services, Relevant Cloud Security Design Principles, Secure Cloud Software Requirements, Approaches to Cloud Software Requirements Engineering, Cloud Security Policy Implementation, Secure Cloud Software Testing, Cloud Computing Security Challenges, Virtualization Security Management, VM Security Recommendations, VM-Specific Security Techniques.	**08 Hours** **L3**

Module 5	
Case Study on Open Source & Commercial Clouds: Amazon AWS, Google Cloud, Microsoft Azure Using Amazon Web Services, Amazon Web Service Components and Services, working with the Elastic Compute Cloud (EC2), Working with Amazon Storage Systems, Understanding Amazon Database Services, Google AppEngine, Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations, Microsoft Azure, Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance, CRM and ERP.	**08 Hours L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE544.1	Explain the concepts and terminologies of cloud computing
21ISE544.2	Identify the architecture and infrastructure of cloud computing depending on application
21ISE544.3	Discuss data intensive computing and its technologies.
21ISE544.4	Explain the core issues of cloud computing such as security, privacy, and interoperability.
21ISE544.5	Describe the use of AWS, Azure and Google cloud platform to develop applications

Textbooks:

1. Cloud Computing Principles and Paradigms, Rajkumar Buyya, James Broberg, Andrzej Goscinski, Wiley Publishers,2011
2. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

Reference books:

1. **Thomas Erl**, Cloud Computing: Concepts, Technology & Architecture, Pearson.
2. **John Rhoton**, Cloud Computing Explained: Handbook for Enterprise Implementation.
3. Cloud Computing (Wind) by **Dr. Kumar Saurabh**, 2nd Edison, Wiley India
4. Cloud Computing **Bible, Barrie Sosinsky**, Wiley-India, 2010
5. **Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi** Mastering Cloud. Computing McGraw Hill Education

E-Books / Web References

1. https://www.udemy.com/topic/cloud-computing/https://www.udemy.com/topic/artificial-intelligence
2. https://www.youtube.com/watch?v=EN4fEbcFZ_E&ab_channel=Simplilearn

MOOCs

https://onlinecourses.nptel.ac.in/noc21_cs14

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component. CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE544.1	3	2	1	1	2	-	-	-	-	-	-	2	2	-	-	-
21ISE544.2	3	2	1	1	2	-	-	-	-	-	-	2	2	-	-	-
21ISE544.3	3	2	1	1	2	-	-	-	-	-	-	2	2	-	-	-
21ISE544.4	3	2	1	1	2	-	-	-	-	-	-	2	2	-	-	-
21ISE544.5	3	2	1	1	2	-	-	-	-	-	-	2	2	-	-	-
Average	3	2	1	1	2	-	-	-	-	-	-	2	2	-	-	-

Low-1: Medium-2: High-3

SEMESTER – V

Course: Research Methodology

Course Code	21ISE55	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3 hrs.

Course Learning Objectives:

CLO1	Understand some basic concepts of research and its methodologies
CLO2	To understand the process of research design
CLO3	Know the importance of review literature, data collection and data processing
CLO4	To know the steps in writing the research report.

Content	No. of Hours/ RBT levels
Module 1 **Research Methodology:** Introduction, Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India. Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem. **Chapter 01()1.1 to 1.10 and Chapter 2 (2.1 to 2.4): Text book 1**	**08 Hours** **L2**
Module 2 **Research Design:** Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental designs. **Chapter 03 (3.1 to 3.7) : Text book 1**	**06 Hours** **L2**
Module 3 **Reviewing the literature:** The place of the literature review in research, Bringing clarity and focus to your research problem, Improving your research methodology, Broadening your knowledge base in your research area, Enabling you to contextualise your findings, How to review the literature, Searching for the existing literature, Reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed. **Formulating a research problem**: The research problem, The importance of formulating a research problem, Sources of research problems, Considerations in selecting a research problem, Steps in formulating a research problem, The formulation of research objectives, The study population, Establishing operational definitions, Formulating a research problem in qualitative research. **Chapter 3 and 4: Text book 02**	**10 Hours** **L2**
Module 4 **Data Collection:** Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaires, Collection of Data through Schedules, Difference between Questionnaires and Schedules, Some Other Methods of Data	**08 Hours** L2

Collection, Collection of Secondary Data, Selection of Appropriate Method for Data Collection. **Data Preparation:** Data Preparation Process, Some Problems in Preparation Process, Missing Values and Outliers, Types of Analysis, Statistics in Research. **Chapter 06(6.1 t 6.5) and 07(7.1 to 7.5) : Text book 1**	
Module 5 **Interpretation and Report Writing:** Meaning of Interpretation, Why Interpretation?, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports. **Chapter 19: Text book 1**	**08 Hours** **L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE55.1	Understand the meaning, objectives, types, approaches and significance of the research by defining the research problem.
21ISE55.2	Discuss the meaning of Research Design, design features and its need along with Important Concepts Relating to Research Design.
21ISE55.3	Understand how to carry out a literature search and writing a literature review
21ISE55.4	Discuss the various data collection and preparation of data during research.
21ISE55.5	Understand the importance of interpretation and report writing.

Textbooks:

1. Research Methodology Methods and Techniques, C.R. Kothari, Gaurav Garg, New Age International Publishers, 4th Edition, 2019.
2. Research Methodology a step-by-step guide for beginners, Ranjit Kumar, SAGE Publications Ltd, 3rd Edition, 2011.

Reference books:

1. Fundamental of Research Methodology and Statistics, by YK Singh · 2021

MOOCs

https://in.coursera.org/learn/research-methods

https://www.mooc-list.com/tags/research-methodology

https://www.london.ac.uk/courses/understanding-research-methods

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.

CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting

quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE55.1	2	-	-	-	1	2	2	3	2	1	2	1	-	-	-	1
21ISE55.2	2	-	-	-	1	2	2	3	2	1	2	1	-	-	-	1
21ISE55.3	2	-	-	-	1	2	2	3	2	1	2	1	-	-	-	1
21ISE55.4	2	-	-	-	1	2	2	3	2	1	2	1	-	-	-	1
21ISE55.5	2	-	-	-	1	2	2	3	2	1	2	1	-	-	-	1
Average	2	-	-	-	1	2	2	3	2	1	2	1	-	-	-	1

Low-1: Medium-2: High-3

SEMESTER – V

Course: Physical Activity, Health and Wellness

Semester:	**5**	**CIE Marks**	**50**
Course Code	**21ISE561**	**SEE Marks**	**50**
Hours/Week (L: T: P)	**1:0:0**	**Duration of SEE (hours):**	**3**
Type of Course	**AEC**	**Credits**	**1**

Course Learning Objectives:

CLO1	To introduce the fundamental concepts of physical education, health and wellness.
CLO2	To provide a general understanding on nutrition, first aid and stress management.
CLO3	To familiarize the students regarding yoga and other activities for developing fitness.
CLO4	To create awareness regarding hypo-kinetic diseases and various measures of fitness and health assessment.

Module 1	**No. of Hours** **RBT Level**
Concept of Physical Education and Health: Definition, Aims and Objectives of Physical Education Importance and Scope of Physical Education Modern concept of Health, Physical fitness and Wellness	**03 Hours** **L2**
Module 2	
Components of Physical Fitness: Physical fitness components: Speed, Strength, Endurance, Flexibility and Coordinative abilities. Types of Physical Fitness - Health related Physical Fitness - Performance related Physical Fitness - Cosmetic Fitness Fitness Balance	**03 Hours** **L2**
Module 3	
Principles of Exercise Programme: Activities for developing Physical Fitness Components Principles of First Aid Nutritional Balance	**03 Hours** **L2**
Module 4	
Lifestyle Disease and its Management: Lifestyle Disease, Hypo-kinetic Diseases and its Management - Diabetes - Hypertension - Obesity - Osteoporosis - CHD - Back pain Health related Physical Fitness and Assessment Body Mass Index/ Skin fold Measurement, BMR, Pulse Rate, and Blood Pressure Health Related Physical fitness Test	**03 Hours** **L2**

Course Outcomes: Upon successful completion of this course, student will be able to

21ISE561.1	Identify personal health priorities and be able to integrate those priorities with personal behavior choices.
21ISE561.2	Explain an awareness of fact and fiction with regard to relationships between young people's health, activity and fitness
21ISE561.3	Explain the importance of nutrition and how to make nutritive plans.
21ISE561.4	Explain the concept of lifestyle disease, what contributes to it and prevent the same.

Reference Books:

1. AAPHERD, Health Related Physical Fitness Test Manual, 1980,Association Drive, Reston Virginia
2. ACSM Fitness Book, Leisure Press campaign, Illinois, 1986, Leisure Press, Canada, http:// www.pitt.edu./-gsphhome
3. ACSM'S Health Related Physical Fitness Assessment Manual, Lippincott Williams and Walkins, USA,2005
4. B.C.Rai, Health education and Hygiene, Prakashan Kendra, Lucknow.
5. Norman Bezzant, Help, First Aid for everyday emergencies, Jaico Publishing House, Bombay, Delhi.
6. Puri, K. Chandra, S.S. Health and Physical Education, Surjeet Publications, New Delhi, 2005.
7. Dr K.P.Manoj & Dr. K.Sureshkutty, Physical activity, Health and Wellness, Publication Division, University of Calicut, 2011.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE561.1	-	-	3	-	-	-	-	-	-	-	-	3	1	-	-	-
21ISE561.2	-	-	3	-	-	-	-	-	-	-	-	3	1	-	-	-
21ISE561.3	-	-	3	-	-	-	-	-	-	-	-	3	1	-	-	-
21ISE561.4	-	-	3	-	-	-	-	-	-	-	-	3	1	-	-	-
Average	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**1**	**-**	-	-

Low-1: Medium-2: High-3

SEMESTER – V

Course: Leadership and Management Skills

Semester:	**5**	**CIE Marks**	**50**
Course Code	**21ISE562**	**SEE Marks**	**50**
Hours/Week (L: T: P)	**1:0:0**	**Duration of SEE (hours):**	**3**
Type of Course	**AEC**	**Credits**	**1**

Course Learning Objectives:

CLO1	To provide a basic introduction to leadership by focusing on what it means to be a good leader.
CLO2	Emphasis is on developing managerial skills and develop self-awareness
CLO3	Enable student to develop leadership qualities
CLO4	Addressing ethics in leadership and overcoming obstacles.

Module 1	**No. of Hours RBT Level**
Leadership Skills and Understanding Leadership and its Importance: What is Leadership?, Why Leadership required?, Whom do you consider as an ideal leader?, Traits and Models of Leadership, Are Leader born or made?, Key characteristics of an effective leader, Leadership styles, Perspectives of different leaders, Basic Leadership Skills, Motivation, Team work, Negotiation, Networking.	**03 Hours L2**
Module 2	
Managerial Skills: Basic Managerial Skills, Planning for effective management, How to organize teams, Recruiting and retaining talent, Delegation of tasks, Learn to coordinate, Conflict management **Self-Management Skills:** Understanding self-concept, Developing self-awareness, Self-examination, Self-regulation.	**03 Hours L2**
Module 3	
Innovative Leadership and Design Thinking: Innovative Leadership, Concept of emotional and social intelligence, Synthesis of human and artificial intelligence, Why does culture matter for today's global leaders **Design Thinking:** What is design thinking?, Key elements of design thinking: - Discovery - Interpretation - Ideation - Experimentation – Evolution, How to transform challenges into opportunities?, How to develop human-centric solutions for creating social good?.	**03 Hours L2**
Module 4	
Ethics and Integrity: Learning through Biographies, What makes an individual great?, Understanding the person of a leader for deriving holistic inspiration, Drawing insights for leadership, How leaders sail through difficult situations? **Ethics and Conduct:** Importance of ethics, Ethical decision making, Personal and professional moral codes of conduct, Creating a harmonious life.	**03 Hours L2**

Course Outcomes: Upon successful completion of this course, student will be able to

21ISE562.1	Develop leadership qualities by taking initiatives and motivating team members to perform.
21ISE562.2	Identify general knowledge framework and understanding of key functions in management and appreciate the ethical issues in management decision areas.
21ISE562.3	Describe what leaders and managers do to drive their organizations forward by leading and managing issues and challenges
21ISE562.4	Recognize ethical and moral issues, identify needed actions, and demonstrate the moral courage to implement them.

Reference Books:

1. SIA Publishers, "Leadership and Management skills".
2. Dale Carnegie, " How to Win Friends and Influence People".
3. Stephen R. Covey, "7 Habits of Highly Effective People".
4. John Maxwell, "The 21 Irrefutable Laws of Leadership"
5. Daniel Goleman." Leadership – The power of Emotional Intelligence
6. Harvard Business School online - How to Become a More Effective Leader

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE562.1	-	-	-	-	-	-	-	3	3	3	3	3	-	-	-	-
21ISE562.2	-	-	-	-	-	-	-	3	3	3	3	3	-	-	-	-
21ISE562.3	-	-	-	-	-	-	-	3	3	3	3	3	-	-	-	-
21ISE562.4	-	-	-	-	-	-	-	3	3	3	3	3	-	-	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**

Low-1: Medium-2: High-3

SEMESTER – V

Course: Environmental Science

Course Code	21CIV57	CIE Marks	50
Hours/Week (L: T: P)	1:0:0	SEE Marks	50
No. of Credits	1	Examination Hours	1 hour

Course Learning Objectives:

CLO1	The fundamentals of environmental science.
CLO2	The types of natural resources
CLO3	The various global environmental concerns.
CLO4	The types of wastes generated and their handling at a basic level
CLO5	The area of environmental law and policies with a few important acts in the field

Content	No. of Hours/ RBT Levels
Module 1 **Environment:** • Definition, scope & importance • Components of Environment Ecosystem: Structure and function of various types of ecosystems • Human Activities – Food, Shelter, and Economic & Social Security. • Population - Growth, variation among nations – population explosion and impact on environment **Biodiversity:** Types, Value; Hot spots; Threats and Conservation of biodiversity, Forest Wealth, and Deforestation.	**04 Hours / L2**
Module 2 **Natural Resources**: Forest, Water, Mineral, Food, Energy, Land Environmental Pollution - Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards.	**04 Hours / L2**
Module 3 **Global Environmental Concerns** (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology.	**04 Hours / L2**
Module 4 **Sources:** Sources of Solid waste, Types of solid waste, Physical and Chemical composition of municipal solid waste. Solid Waste Management Rules in India Sources and management of E – Waste, Biomedical Waste, Hazardous waste, and construction waste at individual and community level. Socio-economic aspect of waste management Environmental Toxicology.	**04 Hours / L2**
Module 5 **Latest Developments in Environmental Pollution Mitigation Tools** (Concept and Applications): Environment Impact Assessment, Environmental Management Systems, ISO14001; Environmental Stewardship, NGOs.	**04 Hours / L2**

COURSE OUTCOMES: Upon completion of this course, student will be able to:

21CIV57.1	Understand holistically the key concepts "Environment", and "Biodiversity".
21CIV57.2	Classify the types of natural resources available and the effects of anthropogenic interventions.
21CIV57.3	Express the gravity of various global environmental concerns.
21CIV57.4	Categorize the types of wastes generated and their handling at a basic level.
21CIV57.5	Understand the importance of environmental law and policies.

Textbooks:

1. Environmental studies, Benny Joseph, Tata Mcgraw-Hill 2nd edition 2012
2. Environmental studies, S M Prakash, pristine publishing house, Mangalore 3rd edition-2018
3. Gilbert M.Masters, Introduction to Environmental Engineering and Science, 2nd edition, Pearson Education, 2004

Reference books:

1. Benny Joseph, Environmental studies, Tata Mcgraw-Hill 2nd edition 2009
2. M.Ayi Reddy Textbook of Environmental Science and Technology, BS publications 2007
3. Dr. B.S Chauhan, Environmental Studies, University of science press 1st edition

Web References:

https://www.hzu.edu.in/bed/E%20V%20S.pdf

https://onlinecourses.nptel.ac.in/noc23_hs155/preview

https://onlinecourses.swayam2.ac.in/cec19_bt03/preview

Scheme of Examination:

Semester End Examination (SEE): SEE Question paper is to be set for 50 marks with multiple choice questions of 1 mark each covering all aspects of the syllabus.

Continuous Internal Evaluation (CIE): Three Tests are to be conducted for 50 marks each. The average of the three tests are taken for computation of CIE. Question paper for each of the CIE is to be of the multiple-choice type with 50 question each.

Typical Evaluation pattern for regular courses is shown in Table.

Table 1: Distribution of weightage for CIE & SEE for 1 credit course

	Component	Marks	Total Marks
CIE	CIE Test-1	**50**	**50**
	CIE Test-2	**50**	
	CIE Test-2	**50**	
SEE	Semester End Examination	**50**	**50**
		Grand Total	**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21CIV57.1	2	-	-	-	-	-	3	-	-	-	-	-	1	-	-
21CIV57.2	2	1	-	-	-	-	3	-	-	-	-	1	1	-	1
21CIV57.3	2	-	2	-	-	2	3	1	-	-	-	1	1	-	1
21CIV57.4	2	2	-	-	-	2	3	-	-	-	-	-	-	-	1
21CIV57.5	2	-	-	-	-	2	3	-	-	-	-	-	-	1	1
Average	**2**	**1.5**	**2**	**-**	**-**	**2**	**3**	**1**	**-**	**-**	**-**	**1**	**1**	**1**	**1**

Low-1: Medium-2: High-3

SEMESTER – V

Course: Universal Human Values

Course Code	21UHV57	CIE Marks	50
Hours/Week (L: T: P)	1:0:0	SEE Marks	50
No. of Credits	1	Examination Hours	1 hour

Course Learning Objectives:

CLO1	To create an awareness on Engineering Ethics and Human Values.
CLO2	To understand social responsibility of an engineer.
CLO3	To appreciate ethical dilemma while discharging duties in professional life.

Content	No. of Hours
Module 1 **Introduction to Value Education** • Value Education, Definition, Concept and Need for Value Education. • The Content and Process of Value Education. • Basic Guidelines for Value Education, • Self-exploration as a means of Value Education. • Happiness and Prosperity as parts of Value Education.	**05 Hours**
Module 2 **Harmony in the Human Being** • Human Being is more than just the Body. • Harmony of the Self ('I') with the Body. • Understanding Myself as Co-existence of the Self and the Body. • Understanding Needs of the Self and the needs of the Body. • Understanding the activities in the Self and the activities in the Body.	**05 Hours**
Module 3 **Harmony in the Family and Society and Harmony in the Nature** • Family as a basic unit of Human Interaction and Values in Relationships. • The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory, Gratitude and Love, • Comprehensive Human Goal: The Five Dimensions of Human Endeavour. • Harmony in Nature: The Four Orders in Nature. • The Holistic Perception of Harmony in Existence.	**05 Hours**
Module 4 **Social Ethics** • The Basics for Ethical Human Conduct, Defects in Ethical Human Conduct. • Holistic Alternative and Universal Order, • Universal Human Order and Ethical Conduct. • Human Rights violation and Social Disparities.	**05 Hours**
Module 5 **Professional Ethics** • Value based Life and Profession., Professional Ethics and Right Understanding. • Competence in Professional Ethics. • Issues in Professional Ethics – The Current Scenario. • Vision for Holistic Technologies • Production System and Management Models.	**05 Hours**

COURSE OUTCOMES: Upon completion of this course, student will be able to:

21UHV57.1	Understand the significance of value inputs in a classroom and start applying them intheir life and profession
21UHV57.2	Distinguish between values and skills, happiness and accumulation of physical facilities,the Self and the Body, Intention and Competence of an individual, etc.
21UHV57.3	Understand the role of a human being in ensuring harmony in society and nature.
21UHV57.4	Distinguish between ethical and unethical practices and start working out the strategy toactualize a harmonious environment wherever they work.

Textbooks:

1.A.N Tripathy, New Age International Publishers, 2003. 2.Bajpai.
B. L, New Royal Book Co, Lucknow, Reprinted, 2004 3.Bertrand
Russell Human Society in Ethics & Politics

Reference books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Corliss Lamont, Philosophy of Humanism.
4. Gaur. R.R. , Sangal. R, Bagari G.P, A Foundation Course in Value Education,Excel Books, 2009.
5. Gaur. R.R. , Sangal R , Bagaria G.P, Teachers Manual, Excel Books, 2009.
6. I.C. Sharma, Ethical Philosophy of India, Nagin & co, Julundhar
7. William Lilly- Introduction to Ethics -Allied Publisher

Scheme of Examination:

Semester End Examination (SEE): SEE Question paper is to be set for 50 marks with multiple choice questions of 1 mark each covering all aspects of the syllabus.

Continuous Internal Evaluation (CIE): Three Tests are to be conducted for 50 marks each. The average of the three tests are taken for computation of CIE. Question paper for each of the CIE is to be of the multiple-choice type with 50 question each.

Typical Evaluation pattern for regular courses is shown in Table.

Table 1: Distribution of weightage for CIE & SEE for 1 credit course

	Component	Marks	Total Marks
CIE	CIE Test-1	**50**	**50**
	CIE Test-2	**50**	
	CIE Test-2	**50**	
SEE	Semester End Examination	**50**	**50**
		Grand Total	**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21UHV57.1	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
21UHV57.2	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
21UHV57.3	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
21UHV57.4	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**

Low-1: Medium-2: High-3

6th Semester Syllabus

SEMESTER – VI

Course: Web Technologies

Course Code	21ISE61	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Course Learning Objectives:

CLO1	Illustrate the Semantic Structure of HTML and CSS
CLO2	Design Client-Side programs using JavaScript
CLO3	Understand the concepts of AngularJS
CLO4	Infer Object Oriented Programming capabilities of PHP
CLO5	Examine JavaScript frameworks such as jQuery and AJAX

Content	No.of Hours/ RBT levels
Module 1 **Introduction to HTML**, What is HTML and Where did it come from?, HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.**HTML Tables and Forms**, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Micro formats.	**08 Hours L2**
Module 2 **JavaScript:** Client-Side Scripting, What is JavaScript and What can it do?, Where does JavaScript Go?, Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms.	**08Hours L2**
Module 3 **Introducing AngularJS** Starting out with AngularJS, Basic AngularJS Directives and Controllers AngularJS Modules, Creating Our First Controller, Working with and Displaying Arrays, More Directives, Working with ng-repeat. Forms, Inputs, and Services, Working with ng-model, Working with Forms, Leverage Data-Binding and Models, Form Validation and States, Error Handling with Forms, Displaying Error Messages, Styling Forms and States, Nested Forms with ng-form, Other Form Controls	**08 Hours L3**
Module 4 **Introduction to Server-Side Development with PHP**, What is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions PHP Arrays and Superglobals, Arrays, $_GET and $_POST Super global Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design	**08 Hours L3**

Module 5	
Managing State The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, HTML5 Web Storage, Caching, Advanced JavaScript and jQuery, JavaScript Pseudo Classes, jQuery Foundations, AJAX, Asynchronous File Transmission	**08 Hours L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE61.1	Develop web pages using HTML tags and CSS.
21ISE61.2	Apply JavaScript concepts in developing client side scripts.
21ISE61.3	Build dynamic web pages using the concepts of Angular JS
21ISE61.4	Illustrate the usage of advanced PHP concepts in developing complex server-side programs.
21ISE61.5	Discuss web services, applications, and JavaScript frameworks like jQuery to focus on core features.

Textbooks:

1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 2nd Edition, Pearson Education India. (ISBN:978-0134481267).
   ecopy:https://vdoc.pub/download/fundamentals-of-web-development-3rhv8jsrftig
2. ShyamSeshadri and Brad Green, "AngularJS-Up-and-Running", First Edition, O'Reilly Media, Inc., (ISBN: 978-1-491-90194-6).
   ecopy: https://pepa.holla.cz/wp-content/uploads/2015/10/AngularJS-Up-and-Running.pdf

Reference books:

1. Robin Nixon, "Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5", 4th Edition, O'Reilly Publications, 2015. (ISBN:978-9352130153)
2. Luke Welling, Laura Thomson, "PHP and MySQL Web Development", 5th Edition, Pearson Education, 2016. (ISBN:978-9332582736)
3. Nicholas C Zakas, "Professional JavaScript for Web Developers", 3rd Edition, Wrox/Wiley India, 2012. (ISBN:978-8126535088)
4. David Sawyer Mcfarland, "JavaScript & jQuery: The Missing Manual", 1st Edition, O'Reilly/Shroff Publishers & Distributors Pvt Ltd, 2014

MOOCs:

1. Full Stack Web Development :https:/simplilearn.com/
2. Web Design for Everybody:https://www.coursera.org/
3. The Complete 2022 Web Development Bootcamp:https://www.udemy.com/

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs:
Seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-athon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE61.1	2	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
21ISE61.2	2	2	2	-	2	-	-	-	-	-	-	2	2	-	-	-
21ISE61.3	2	2	2	-	2	-	-	-	-	-	-	2	-	-	-	-
21ISE61.4	2	2	2	-	2	-	-	-	-	-	-	2	2	-	-	-
21ISE61.5	2	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-
Average	2	2	2	-	2	-	-	-	-	-	-	2	2	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Machine Learning (Integrated)

Course Code	21ISE62	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	4	Examination Hours	03

Course Learning Objectives:

CLO1	Define machine learning and problems relevant to machine learning.
CLO2	Differentiate between supervised and unsupervised learning
CLO3	Apply neural networks, Bayesian classifier and k nearest neighbour for solving problems in machine learning.
CLO4	Perform statistical analysis of machine learning techniques.

Content	No.of Hours/ RBT levels
Module 1 **Introduction**: A Brief Introduction To Machine Learning, Examples of Machine learning Applications. **(Text book -3) Regression**: Linear Regression, Polynomial Regression. **Decision Tree Learning**: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm **(Text book -1)**	**10 Hours L2**
Module 2 **Support Vector Machine**: Introduction to Support Vector Machine, characteristics of SVM. **(Text book - 4) K-nearest neighbour**: Introduction, advantage, and applications **(Text book -1)** **Clustering**: k-means, Hierarchical Clustering**(Text book -3)**	**10 Hours L3**
Module 3 **Bayesian Learning**: Introduction to Conditional probability, Bayes theorem, ML and LS error hypothesis, Naive Bayes classifier **(Text book -1) Artificial Neural Networks**: Introduction, Neural Network representation, Perceptron, Back propagation algorithm. **(Text book -1)**	**10 Hours L3**
Module 4 **Evaluating Hypothesis**: Estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis **(Text book -1)**	**10 Hours L3**
Module 5 **Reinforcement Learning**: Learning to Optimize Rewards, Credit Assignment Problem, Temporal Difference Learning and Q Learning. **(Text book -1) AI/ML Case Study**: Artificial Intelligence Powering Google Products, Recent AI Tools leveraged by Tesla, AI for Facebook, Robo-Banking: Artificial Intelligence at JPMorgan Chase, Audio AI, A Machine Learning Approach — Building a Hotel Recommendation Engine	**10 Hours L3**

Program List	
1	Consider a dataset containing large number of missing data and develop a program to use pre-processing technique to handle those.
2	Develop a program to demonstrate linear and polynomial regression using appropriate data set.
3	Develop a program to demonstrate logistic regression using appropriate data set.
4	Develop a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
5	Develop a program to implement the random forest Classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6	Develop a program to construct Support Vector Machine considering a Sample Dataset.
7	Develop a program to implement K-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
8	Build an Artificial Neural Network using the Back propagation algorithm and test the same using appropriate data sets.
9	Develop a program to implement the naïve Bayesian Classifier model. Calculate the accuracy, precision, and recall, ROC curve for your data set.
10	Implement K Means algorithm using appropriate Data sets.

COURSE OUTCOMES: Upon completion of this course, student will be able to:

21ISE62.1	Illustrate Regression Techniques and Decision Tree Learning Algorithm
21ISE62.2	Apply SVM, ANN and KNN algorithm to solve appropriate problems
21ISE62.3	Apply Bayesian Techniques and derive effective learning rules
21ISE62.4	Illustrate performance of AI and ML algorithms using evaluation techniques.
21ISE62.5	Understand reinforcement learning and its application in real world problems.

Text Books:

1. Tom M. Mitchell, Machine Learning, McGraw Hill Education, India Edition 2013.
2. EthemAlpaydın, Introduction to machine learning, MIT press, Second edition.
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson, First Impression, 2014.

Reference Books:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer series in
statistics, 2nd edition.
2. DipanjanSarkar,Raghav Bali ,Tushar Sharma, "Practical Machine Learning with Python-A Problem-Solver's Guide to Building Real-World Intelligent Systems",APress,2018
3. Kevin P. Murphy , Francis Bach , "Machine Learning: A Probabilistic Perspective (Adaptive Computation and Machine Learning) 1st Edition, Massachusets Institute of Technology,2012
4. Anil Maheswari, Data Analytics, McGraw Hill, India, 2017

E-Books/Web References:

1.Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz and Shai Ben-David, Cambridge University Press.
2. https://medium.com/@prithvilee22/ai-ml-case-study-55d34e308c92
3.https://digital.hbs.edu/platform-digit/submission/robo-banking-artificial-intelligence-at-jpmorgan-chase/
4.https://towardsdatascience.com/a-machine-learning-approach-building-a-hotel-recommendation-engine-6812bfd53f50
5.https://www.udemy.com/topic/artificial-intelligence
(https://www.cs.huji.ac.il/~shais/UnderstandingMachineLearning/index.html)
6. A Brief Introduction to Neural Networks, David Kriesel
(http://www.dkriesel.com/_media/science/neuronalenetze-en-zeta2-2col-dkrieselcom.pdf)
7. http://gael-varoquaux.info/scikit-learn-tutorial/

MOOCs:

1. https://onlinecourses.nptel.ac.in/noc20_cs29/preview
2. https://www.simplilearn.com/pgp-ai-machine-learning-certification-training-course
3. https://www.udemy.com/course/machinelearning/
4. https://www.coursera.org/learn/machine-learning

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests for theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Lab CIE is conducted for 20 marks and is added to theory component.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test- 3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE62.1	3	3	2	-	1	1	-	-	-	-	-	2	-	3	-	-
21ISE62.2	3	3	2	-	1	1	-	-	-	-	-	2	-	3	-	-
21ISE62.3	3	3	2	-	1	1	-	-	-	-	-	2	-	3	-	-
21ISE62.4	3	3	2	-	1	1	-	-	-	-	-	2	-	3	-	-
21ISE62.5	3	3	2	-	1	1	-	-	-	-	-	2	-	3	-	-
Average	3	3	2	-	1	1	-	-	-	-	-	2	-	3	-	-

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Wireless Sensor Network and IOT (Integrated)

Course Code	21ISE63	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	4	Examination Hours	3

Course Learning Objectives:

CLO1	Describe the OSI Model for IoT/M2M Systems.
CLO2	Understand the architecture and design principles for device supporting IoT
CLO3	Develop competence in programming for IoT Applications
CLO4	Identify the uplink and downlink communication protocols which best suits the specific application of IoT/WSNs.

Content	No.of Hours/ RBT levels
Module 1 **Overview of Wireless Sensor Networks:** Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks. **Architecture:** Single Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Design Principles of WSN's.	**10 Hours L2**
Module 2 **Communication Protocols:** Physical Layer and Transceiver Design Considerations, Fundamentals of MAC Protocols, Low Duty Cycle Protocols And Wakeup Concepts, Contention-based protocols, Schedule-based protocols, IEEE 802.15.4 MAC Protocol.	**10Hours L3**
Module 3 **Overview of Internet of Things:** IoT Conceptual Framework, IoT Architectural View, Technology Behind IoT, Sources of IoT, M2M communication, Examples of IoT. IoT/M2M Systems layers and design standardization, Data enrichment, Data consolidation and device management at Gateway.	**10 Hours L3**
Module 4 **Internet Connectivity Principles**: Internet connectivity, Internet-based communication, IP Addressing in the IoT, Application layer protocols: HTTP, HTTPS, FTP, TELNET and others. **Data Collection, Storage and Computing using a Cloud Platform:** Introduction, Cloud computing paradigm for data collection, storage and computing. Cloud service models, IoT Cloud- based services using xively, Nimbits and other platforms.	**10 Hours L3**
Module 5 **Prototyping and designing software for IoT Applications:** Introduction, Prototyping Embedded device software, Devices, gateways, Internet and web/ cloud services software development, Prototyping online component API's & Web API's.	**10 Hours L3**

Program List	
1	Write python code to interface LED switch and potentiometer.
2	Write python code to print status of computer screen using serial motor.
3	Write python code to interface temperature sensor.
4	Write python code to interface light sensor.
5	Write python code to measure the speed of sound using ultrasonic sensor.
6	Write python code to detect obstacle using infrared sensor.
7	Write python code to monitor the temperature and to display the read temperature on LCD.
8	Write python code to generate special characters by their coding schemes and display on to the LCD.
9	Write python code for 7 segment display.
10	Write python code to interface GPS to find the global coordinates of a position.

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE63.1	Understand the basic architecture and communication protocols of WSNs
21ISE63.2	Illustrate the communication protocols associated with physical layer and MAC Layer.
21ISE63.3	Interpret the basic concepts of IoT and applications of M2M communication protocols.
21ISE63.4	Describe cloud computing and design principles of IoT.
21ISE63.5	Outline the concept of prototyping and designing software for IoT applications.

Textbooks:

1. **Protocols And Architectures for Wireless Sensor Networks**, Holger Karl & Andreas Willig, John Wiley, 2005.
2. **Internet of Things - Architecture and design principles**, Raj Kamal, McGraw Hill Education.

Reference books:

1. **Wireless Sensor Networks - An Information Processing Approach**, Feng Zhao & Leonidas J Guibas , Elsevier 2007.
2. **Internet of Things,** Srinivasa K G **,** CENCAGE Learning India,2017

MOOCs:

1. http://nptel.ac.in/courses.php?disciplineId=111
2. https://www.khanacademy.org/
3. https://www.class-central.com/subject
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):
Three Tests for theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Lab CIE is conducted for 20 marks and is added to theory component.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test- 3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE63.1	3	2	-	-	2	2	-	2	-	-	-	3	-	3	-	-
21ISE63.2	3	2	-	-	2	2	-	2	-	-	-	3	-	3	-	-
21ISE63.3	3	2	-	-	2	2	-	2	-	-	-	3	-	3	-	-
21ISE63.4	3	2	-	-	2	2	-	2	-	-	-	3	-	3	-	-
21ISE63.5	3	2	-	-	2	2	-	2	-	-	-	3	-	3	-	-
Average	**3**	**2**	-	-	**2**	**2**	-	**2**	-	-	-	**3**	-	**3**	-	-

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Cryptography

Course Code	21ISE641	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Computer Networks

Course Learning Objectives:

CLO1	To understand the basic concepts underlying classical and modern cryptography, and the fundamentals.
CLO2	To Understand how security is defined and proven at the cryptographic level.
CLO3	To Understand common attacks and how to prevent them.
CLO4	To Gain the ability to apply appropriate cryptographic techniques to a security engineering (and management) problem at hand.

Content	No. of Hours/ RBT levels
Module 1 Classical Encryption Techniques: Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One Time Pad. Block Ciphers and the data encryption standard: Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm.	**08 Hours L2**
Module 2 Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. public-key cryptanalysis. The RSA algorithm, Desription of the algorithm, computational aspects, the security of RSA. Other Public-Key Cryptosystems: Diffie-hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic system.	**08 Hours L2**
Module 3 Elliptic curve arithmetic: Abelian groups, elliptic curves over real numbers, elliptic curves over Zp, elliptic curves overGF (2m), Elliptic curve cryptography, Analog of Diffie-hellman key exchange, Elliptic curve encryption/ decryption, security of Elliptic curve cryptography, Pseudorandom number generation based on an asymmetric cipher, PRNG based on RSA. Key Management and Distribution: Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates.	**08 Hours L2**

Module 4 User Authentication: Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one-way Authentication, Kerberos, Motivation, Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption, Mutual Authentication, one way Authentication. Electronic Mail Security: Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate processing, enhanced security services, Domain keys identified mail, internet mail architecture, E-Mail threats, DKIM strategy, DKIM functional flow.	**08 Hours L2**
Module 5 IP Security: IP Security overview, applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating Security payload, ESP format, encryption and authentication algorithms, Padding, Anti replay service.	**08 Hours L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE641.1	Understand the Define cryptography and its principles, Explain Cryptography algorithms
21ISE641.2	Illustrate Public and Private key cryptography
21ISE641.3	Explain Key management, distribution and certification
21ISE641.4	Explain authentication protocols
21ISE641.5	Tell about IPSec

Textbooks:

1. William Stallings, Cryptography and Network Security: Principles and Practice (ISBN 0131873164), 4/e.

Reference books:

1. Matt Bishop, Computer Security: Art and Science, Addison-Wesley, 2002.
2. MihirBellare and Phillip Rogaway, “Introduction to Modern Cryptography”.

E-Books / Web References:

1. Katz and Y. Lindell, Introduction to Modern Cryptography: Principles and Protocol s, Chapman & Hall/CRC Press, 2nd edition http://www.cs.umd.edu/~jkatz/imc.html
2. A.Menezes, P. Van Oorschot, S. Vanstone, Handbook of Applied Cryptography, CRC Press, August 2001 http://www.cacr.math.uwaterloo.ca/hac/.
3. http://www.freetechbooks.com/information-security-f52.html.

MOOCs:

1. https://crypto.stanford.edu/~dabo/courses/OnlineCrypto/
2. https://www.my-mooc.com/en/mooc/basic-cryptography-and-programming-with-crypto-api/

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component. CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.

Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.

All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs:

Seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE641.1	3	-	3	-	-	-	-	3	-	-	-	-	-	3	-	-
21ISE641.2	3	2	3	-	-	-	-	2	-	-	-	-	-	3	-	-
21ISE641.3	3	2	3	-	-	-	-	3	-	-	-	-	-	3	-	-
21ISE641.4	3	3	3	-	-	-	-	3	-	-	-	-	-	3	-	-
21ISE641.5	3	-	3	-	-	-	-	3	-	-	-	-	-	3	-	-
Average	3	3	3	-	-	-	-	3	-	-	-	-	-	3	-	-

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Advanced Java

Course Code	21ISE642	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Prerequisites: Object Oriented Concepts using JAVA

Course Learning Objectives:

CLO1	Make use of JDBC to access database through Java Programs.
CLO2	Adapt servlets to build server-side programs.
CLO3	Build web applications using JSP
CLO4	Introduce Graphical User Interface (GUI) programming using swings.
CLO5	Explore micro service-based Java web framework using spring

Content	No. of Hours/ RBT levels
Module 1 **Overview of JDBC:** The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; Result Set; Transaction Processing; Metadata, Data types; Exceptions.	**08 Hours L3**
Module 2 **Servlet Programming:** Life cycle of servlet, Using Tomcat for Servlet, Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP, Requests and Responses; Using Cookies; Session Tracking.	**08Hours L3**
Module 3 **Java Server Pages:** JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects. Java Remote Method Invocation: Remote Method Invocation concept; Server side, Client side	**08 Hours L3**
Module 4 **Swings:** The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField; The Swing Buttons; Tablespace; JScrollPane; JList; JComboBox; JTable.	**08 Hours L3**
Module 5 **Boot starting Spring:** Spring rebooted, Getting started with Spring Boot, developing your first Spring Boot application, Deploying Spring Boot applications.	**08 Hours L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE642.1	Apply JDBC technique to access database through Java programs.
21ISE642.2	Interpret the concepts of servlets to build server-side programs.
21ISE642.3	Demonstrate JSP tags in web application development
21ISE642.4	Develop GUI using swing concepts
21ISE642.5	Illustrate the concepts of Spring Boot framework

Textbooks:

1. J2ME: The Complete Reference, James Keogh, McGraw-Hill/Osborne 2003 – Chapter 10
2. Herbert Schildt, Java the Complete Reference, 7th Edition, Tata McGraw Hill, 2007- Chapter 31, 29, 30
3. Spring boot in Action, Craig Walls, Andrew Glover, 3rd Edition, Manning Publications, 2014, Ch 1,2,8. (**https://doc.lagout.org/programmation/Spring%20Boot%20in%20Action.pdf)**

Reference books:

1. Y. Daniel Liang: Introduction to JAVA Programming, 7thEdition, Pearson Education, 2007.
2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education,2004.
3. Uttam K Roy, Advanced JAVA programming, Oxford University press, 2015.

MOOCs:

1. Java Database Connectivity (JDBC) Introduction - https://www.classcentral.com/course/java-database- connectivity-introduction-63501
2. JSP - https://www.coursera.org/learn/java-servlet-pages
3. Java EE: Servlets and JavaServer Pages (JSP) - https://www.classcentral.com/course/linkedin-learning-java-ee-servlets-and-javaserver-pages-jsp-30329
4. Master Java Web Services and RESTful API with Spring Boot - https://www.udemy.com/course/spring-web-services-tutorial/?

Scheme of Examination:

Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs:
Seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make- a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE642.1	3	3	2	1	3	1	-	2	-	-	-	2	2	-	-	-
21ISE642.2	3	3	2	1	3	1	-	2	-	-	-	2	2	-	-	-
21ISE642.3	3	3	2	2	3	2	-	2	-	-	-	2	2	-	-	-
21ISE642.4	3	3	2	2	3	2	-	2	-	-	-	2	2	-	-	-
21ISE642.5	3	3	2	1	3	1	-	2	-	-	-	2	2	-	-	-
Average	3	3	2	2	3	2	-	2	-	-	-	2	2	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Business Intelligence

Course Code	21ISE643	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: SE, DBMS

Course Learning Objectives:

CLO1	Understand the concepts of business intelligence and decision support system
CLO2	Comprehend the concepts of data mining for decision making
CLO3	Explain the working of regression model on the given data set
CLO4	Understand clustering model on the given data set.
CLO5	Understand business intelligence for various applications using marketing

Content	No.of Hours/ RBT levels
Module 1 **Business intelligence:** Effective and timely decisions, Data, information and knowledge, the role of mathematical models, Business intelligence architectures, Ethics, and business intelligence **Decision support systems:** Definition of system, Representation of the decision- making process, Evolution of information systems, Definition of decision support system, Development of a decision support system	**08 Hours L2**
Module 2 **Mathematical models for decision making:** Structure of mathematical models, Development of a model, Classes of models. **Data mining:** Definition of data mining, Representation of input data, Data mining process, Analysis methodologies. **Data preparation:** Data validation, Data transformation, Data reduction	**08Hours L3**
Module 3 **Regression:** Structure of regression, Simple linear regression, multiple linear regression, validation of regression model, selection of productive variables.	**08 Hours L3**
Module 4 **Classification:** Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks. **Clustering:** Clustering methods, Partition methods, Hierarchical methods	**08 Hours L3**

Module 5	
Business intelligence applications: Marketing models: Relational marketing, Sales force management. **Logistic and production models:** Supply chain optimization, Optimization models for logistics planning, Revenue management systems. **Data envelopment analysis:** Efficiency measures, efficient frontier, Identification of good operating practices	**08 Hours** **L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE643.1	Understand the concepts of business intelligence and decision support system
21ISE643.2	Discuss various data mining techniques for decision making
21ISE643.3	Apply regression model on the given data set.
21ISE643.4	Apply clustering model on the given data set.
21ISE643.5	Apply business intelligence for various applications using marketing

Textbooks:

1. **Carlo VercellisPolitecnico di Milano, Italy**: Business Intelligence: Data Mining and Optimization for Decision Making

Reference books:

1. Efraim Turban, Ramesh Sharda, DursunDelen, "Decision Support and Business IntelligenceSystems",9th Edition, Pearson 201
2. David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager‟s Guide", SecondEdition, 2012.
3. Larissa T. Moss, S. Atre, "Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making", Addison Wesley,2003

MOOCs:

1. https://nptel.ac.in/courses/110/105/110105089/
2. http://www.pentaho.com/
3. https://www.edx.org/course/introduction-data-analysis-using-excel-microsoftdat205x-2
4. https://www.ibm.com/developerworks/library/os-weka2/
5. http://www.saedsayad.com/
6. http://www.cs.ccsu.edu/~markov/ccsu_courses/datamining-3.html
7. https://cognitiveclass.ai/

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE643.1	3	2	-	-	-	1	-	1	-	-	-	2	-	2	3	2
21ISE643.2	3	2	-	-	-	1	-	1	-	-	-	2	-	2	3	2
21ISE643.3	3	2	-	-	-	1	-	1	-	-	-	2	-	2	3	2
21ISE643.4	3	2	-	-	-	1	-	1	-	-	-	2	-	2	3	2
21ISE643.5	3	2	-	-	-	1	-	1	-	-	-	2	-	2	3	2
Average	3	2	-	-	-	1	-	1	-	-	-	2	-	2	3	2

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Augmented Reality and Virtual Reality

Course Code	21ISE644	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Basic of math and geometry, programming languages, computer graphics

Course Learning Objectives:

CLO1	To provide the Historical and modern overviews and perspectives on virtual reality.
CLO2	To understand the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.
CLO3	To acquire fundamentals of Computer Vision for Augmented Reality

Content	No.of Hours/ RBT levels
Module 1 Defining Virtual Reality, Modern VR Experience, History of VR, Hardware, Software, Human Physiology and Perception. **(Text Book 1 - Chapter 1,2)**	**08 Hours L2**
Module 2 Geometric Models, Changing Position and Orientation, Axis-Angle Representations of Rotation, Viewing Transformations, Chaining the Transformations, Human Eye, eye movements & implications for VR. **(Text Book 1 - Chapter 3 to 3.5, 4.4, 5.3, 5.4)**	**08Hours L3**
Module 3 Visual Perception - Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates. **(Text Book 1 - Chapter 6 to 6.4, 7.1 to 7.4)**	**08 Hours L3**
Module 4 What Is Augmented Reality - Defining augmented reality, history of augmented reality, Related fields, applications of augmented reality. Augmented Reality Hardware – Displays – Multimodal Displays,Visual Perception, Requirements and Characteristics, Spatial Display Model, Visual Displays. **(Text Book 2 - Chapter 1,2)**	**08 Hours L3**

Module 5	
Tracking & Sensors - Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion. **Computer Vision for Augmented Reality -** Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Simultaneous Localization and Mapping, Outdoor Tracking **(Text Book 2 - Chapter 3,4)**	**08 Hours L3**

Mini-Projects/ Case Study as Assignment:

Create a virtual environment for any use case. The application must include at least 04 scenes which can be changed dynamically, a good UI, animation, and interaction with game objects.

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE644.1	Understand the fundamentals of the Virtual Reality
21ISE644.2	Acquire the knowledge on geometrical principles of Virtual Reality.
21ISE644.3	Illustrate the system of human vision and its implication on perception and rendering.
21ISE644.4	Interpret the working of AR System, hardware and its applications.
21ISE644.5	Explain the concepts of computer vision for AR

Textbooks:

1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2019

2. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India, First edition (12 October 2016), ISBN-10: 9332578494

Reference books:

1. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009.

2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002

3.AR Game Development, Allan Fowler-, 1st Edition, A press Publications, 2018, ISBN 978-1484236178

MOOCs:

1. https://nptel.ac.in/courses/106/106/106106138/
2. https://www.coursera.org/learn/introduction-virtual-reality
3. https://www.coursera.org/learn/ar
4. https://www.udemy.com/share/101XPi/

Scheme of Examination:

Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE644.1	3	-	-	-	-	-	-	-	-	-	-	3	-	1	-	-
21ISE644.2	3	2	2	2	2	-	-	-	2	2	2	3	3	1	-	-
21ISE644.3	3	2	2	2	2	-	-	-	2	2	2	3	3	1	-	-
21ISE644.4	3	2	2	2	2	-	-	-	2	2	2	3	3	1	-	-
21ISE644.5	3	2	2	2	2	-	-	-	2	2	2	3	3	1	-	-
Average	3	2	2	2	2	-	-	-	2	2	2	3	3	1	-	-

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Introduction to Operating Systems

Course Code	21ISE651	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Basics of computers

Course Learning Objectives:

CLO1	Understand concepts and terminology used in Operating Systems
CLO2	Illustrate process scheduling and synchronization with semaphores
CLO3	Illustrate the concept of deadlocks and memory management
CLO4	Explain Virtual memory management and file system
CLO5	Discuss secondary storage structure and its protection

Content	No.of Hours/ RBT levels
Module 1 **Introduction to operating systems, System structures: Introduction**: What operating systems do, Computer System organization, Computer System architecture, 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.	**08 Hours L2**
Module 2 **Process Management: Process concept**: Process Concepts, Process scheduling, Operations on processes, Inter process communication. **Process Scheduling**: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling. **Synchronization**: Background, The critical section problem.	**08Hours L3**
Module 3 **Deadlocks:** System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection and recovery from deadlock. **Memory management strategies**: Background, Swapping, Contiguous memory allocation, Segmentation.	**08 Hours L3**

Module 4 **Virtual Memory Management**: Background, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing. **File System:** File concept, Access methods, Directory and Directory structure, File system mounting, File sharing, Protection.	**08 Hours L3**
Module 5 **Mass Storage Structures, Protection**: **Mass storage structures**; Overview of Mass storage structure, Disk attachment, Disk scheduling, Disk management, Swap space management. **Protection:** Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights.	**08 Hours L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE651.1	Discuss the fundamentals of operating system and its services
21ISE651.2	Describe process management and synchronization
21ISE651.3	Illustrate concept of Deadlock and memory management
21ISE651.4	Discuss the concept of virtual memory management and file systems
21ISE651.5	Understand the secondary storage management with its protection

Textbooks:

1. **Operating System Concepts,** Abraham Silberschatz, Peter B Galvin, Greg Gagne: 9th edition, Wiley-India, 2018

Reference books:

1. **Operating Systems**: A Concept Based Approach, D.M Dhamdhere, McGraw- Hill, 2018.
2. **Operating Systems**: Internals and Design Principles, William Stallings, 6th Edition, Pearson

MOOCs:

1. http://nptel.ac.in
2. https://www.khanacademy.org/
3. https://www.class-central.com (MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE651.1	3	-	-	-	-	-	-	-	-	-	-	3	-	1	-	-
21ISE651.2	3	2	2	2	-	-	-	-	-	-	-	3	3	1	-	-
21ISE651.3	3	2	2	2	-	-	-	-	-	-	-	3	3	1	-	-
21ISE651.4	3	2	2	2	-	-	-	-	-	-	-	3	3	1	-	-
21ISE651.5	3	2	2	2	-	-	-	-	-	-	-	3	3	1	-	-
Average	3	2	2	2	-	-	-	-	-	-	-	3	3	1	-	-

Low-1: Medium-2: High-3

SEMESTER –VI

Course: Introduction to Data Structures

Course Code	21ISE652	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3 hrs

Prerequisites: C Language

Course Learning Objectives:

Sl. No	Course Learning Objectives (CLO)
CLO1	Explain fundamentals of data structures and their applications essential for programming/problem solving.
CLO2	Find suitable data structure during application development/Problem Solving.
CLO3	Illustrate linear representation of data structures: Stack, Queues and Lists in memory
CLO4	Illustrate linear representation of data structures: Trees and Graphs in memory.

Content	No.of Hours/ RBT levels
Module 1 Introduction: Data Structures, Classifications (Primitive &Non-Primitive), Data structure Operations, Review of Arrays, Array Operations: Traversing, inserting, deleting, searching, and sorting. Strings: Basic Terminology, Storing, Operations. Programming Examples.	**08 Hours L3**
Module 2 Stacks: Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. Queues: Definition, Array Representation, Queue Operations, Circular Queues, Priority Queues.	**08Hours L3**
Module 3 Review of Structures, Pointers and Dynamic Memory Allocation Functions. Linked Lists: Definition, Representation of linked lists in Memory and its allocation; Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists	**08 Hours L3**
Module 4 Trees: Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals – In-order, post-order, preorder; Additional Binary tree operations. Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression, Programming Examples	**08 Hours L3**

Module 5	
Exploring Graphs: An introduction to graphs – Graph terminologies, Undirected Graph, Directed Graph, Graph representation in memory. Traversing Graphs, Depth First Search, Breath First Search and Connected components.	**08 Hours L3**

Course Outcomes: Upon successful completion of this course, student will be able to

21ISE652.1	Understand the basic data structures and its representation in memory
21ISE652.2	Apply appropriate algorithm for problem solving using arrays, strings, stacks, queues.
21ISE652.3	Understand the representation of linked lists, trees and graphs in memory.
21ISE652.4	Write programs using linked lists and tree for a given specification.
21ISE652.5	Write programs to perform operations on graphs and its traversals.

Text Books:

1. Ellis Horowitz and SartajSahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2019.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education 2019

Reference Books:

1. Gilberg&Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014.
2. ReemaThareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
3. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications,2nd Ed, McGraw Hill, 2013
4. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996
5. Data Structures and Algorithms, 2008, G. A. V. Pai, TMH
6. Classic Data Structures, 2/e, Debasis , Sarnanta,PHI,2009

E-Books / Web References:

1. http://www.nitjsr.ac.in/course_assignment/CS01CS1302A%20Book%20Fundamentals%20of%20Data%20Structure%20(1982)%20by%20Ellis%20Horowitz%20and%20Sartaj%20Sahni.pdf
2. http://index-of.es/Miscellanous/Data%20Structures%20Using%20C,%202nd%20edition.pdf

MOOCs:

1. Programming and DataStructures: https://nptel.ac.in/courses/106/106/106106130/
2. Data Structures using C: https://www.udemy.com/share/101Fui/
3. Data Structures and Algorithms:https://www.coursera.org/specializations/data-structures-algorithms?action=enrol
4. Data Structures: https://www.coursera.org/learn/data-structures
5. http://cse01-iiith.vlabs.ac.in/

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE652.1	3	3	2	-	2	-	-	-	-	-	-	2	3	-	-	-
21ISE652.2	3	3	2	-	2	-	-	-	-	-	-	2	3	-	-	-
21ISE652.3	3	3	2	-	2	-	-	-	-	-	-	2	3	-	-	-
21ISE652.4	3	3	2	-	2	-	-	-	-	-	-	2	3	-	-	-
21ISE652.5	3	3	2	-	2	-	-	-	-	-	-	2	3	-	-	-
Average	3	3	2	-	2	-	-	-	-	-	-	2	3	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Introduction to JAVA

Course Code	21ISE653	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Course Learning Objectives:

CLO1	Understand the object-oriented concepts in JAVA.
CLO2	Implement the concepts of control structures
CLO3	Discuss the concepts of Inheritance and its types
CLO4	Learn the concepts of importing packages and exception handling mechanism.
CLO5	Discuss the String Handling examples with Object Oriented concepts

Content	No.of Hours/ RBT levels
Module 1 **Introduction to Java**: Java's magic: The Byte code; Java Development Kit (JDK); the Java Buzzwords, Object-oriented programming; Simple Java programs. Data types, variables and arrays.	**08 Hours L2**
Module 2 **Operators:** Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses, Control Statements: Java‟s Selection Statements, Iteration Statements, Jump Statements	**08Hours L2**
Module 3 **Classes:** Classes fundamentals; Declaring objects; Constructors, this keyword, garbage collection. **A Closer Look at Methods and Classes:** Overloading methods, Using Objects as parameters, Returning objects **Inheritance:** Inheritance basics, using super, creating multilevel hierarchy, method overriding, Using Abstract classes.	**08 Hours L3**
Module 4 **Exception handling:** Exception handling in Java. Packages, Access Protection, Importing Packages, Interfaces.	**08 Hours L3**
Module 5 **String Handling:** The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Searching Strings, Modifying a String, Data Conversion Using valueOf( ), Changing the Case of Characters Within a String , Additional String Methods, StringBuffer, StringBuilder	**08 Hours L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE653.1	Illustrate the fundamentals of Java Programming.
21ISE653.2	Demonstrate object oriented concepts in Java.
21ISE653.3	Implement the concepts of inheritance to solve real world problems in Java
21ISE653.4	Apply exception handling mechanism in Java application development.
21ISE653.5	Develop Java programs to process strings using string handler methods.

Textbooks:

1. **Java the Complete Reference,** Herbert Schildt, 11th Edition, Tata McGraw Hill, 2019.

Reference books:

1. **Starting Out with Java**: From Control Structures through Objects Tony Gaddis, Haywood Community College.—6th edition, Pearson Education.2017
2. **Big Java**: **Early Objects**, Cay S. Horstmann, 7th Edition, Wiley Publication.
3. **Advanced JAVA programming**, Uttam K Roy, Oxford University press, 2015.

MOOCs:

1. Programming in java:https://nptel.ac.in/courses/106/105/106105191/
2. Java Tutorial for Complete Beginners: https://www.udemy.com/course/java-tutorial/
3. Core Java Specialization:https://www.coursera.org/specializations/core-java

Scheme of Examination:
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/concept videos/ partial reproduction of research work/ oral presentation of research work/ groupactivity/ developing a generic toolbox for problem solving/ report based on participation in create-athon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE653.1	3	3	3	-	2	-	-	-	-	-	-	1	1	-	-	-
21ISE653.2	3	3	3	-	2	-	-	-	-	--	-	1	2	-	-	-
21ISE653.3	3	3	3	-	2	-	-	-	-	-	-	1	2	-	-	-
21ISE653.4	3	3	3	-	2	-	-	-	-	-	-	1	2	-	-	-
21ISE653.5	3	3	3	-	2	-	-	-	-	-	-	1	2	-	-	-
Average	3	3	3	-	2	-	-	-	-	-	-	1	1.8	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Introduction to Computer Networks

Course Code	21ISE654	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	100

Prerequisites: Basics of Data Communication

Course Learning Objectives:

CLO1	Demonstration of Application Layer Protocols
CLO2	Understand the services offered by transport layer and the working of UDP and TCP protocols.
CLO3	Explain the concept of routers, IP and Routing Algorithms in the network layer
CLO4	Discuss the services offered by various layers of TCP/IP and OSI
CLO5	Illustrate the basic concepts of Multimedia networking

Content	No.of Hours/ RBT levels
Module 1 **Application Layer:** Principles of Network Applications: Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols. The Web and HTTP: Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, User-Server Interaction: Cookies, Web Caching, The Conditional GET, File Transfer: FTP Commands & Replies, Electronic Mail in the Internet: SMTP, Comparison with HTTP, Mail Message Format, Mail Access Protocols, DNS- The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages, Peer-to-Peer Applications: P2P File Distribution, Distributed Hash Tables. **T1: Chap 2**	**08 Hours L2**
Module 2 **Transport Layer :** Introduction and Transport-Layer Services: Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing: Connectionless Transport: UDP,UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer: Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N, Selective repeat, Connection-Oriented Transport TCP: The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control: The Causes and the Costs of Congestion, Approaches to Congestion Control, Network-assisted congestion-control example, ATM ABR Congestion control. **T1: Chap 3**	**08Hours L3**

Module 3 **The Network layer**: What's Inside a Router? Input Processing, Switching, Output Processing, Where Does Queuing Occur? Routing control plane, IPv6,A Brief foray into IP Security, Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing, Routing in the Internet, Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter/AS Routing: BGP, Broadcast and Multicast Routing- Broadcast Routing Algorithms, Multicast. **T1: Chap 4: 4.3-4.7**	**08 Hours L3**
Module 4 Foundation of Networking Protocols: 5 Layer TCP/IP Model, 7 Layer OSI Model, Internet Protocols and Addressing: IP Packet, IP Addressing Scheme, Subnet Addressing and masking, Classless Inter-domain Routing (CIDR), Packet Fragmentation and Reassembly, Internet Control and Message Protocol (ICMP), IP Version 6 (IPv6), Equal sized Packets Model: ATM – ATM Protocol structure, ATM cell structure. **T2: Chap 2**	**08 Hours L3**
Module 5 Multimedia Networking: Properties of video, properties of Audio, Types of multimedia Network Applications, Streaming stored video: UDP Streaming, HTTP Streaming, Adaptive streaming and DASH, content distribution Networks Voice-over-IP : Limitations of the Best-Effort IP Service ,Removing Jitter at the Receiver for Audio ,Recovering from Packet Loss Protocols for Real-Time Conversational Applications , RTP , SIP . **T1: Chap 7**	**08 Hours L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE654.1	Explain principles of application layer protocols
21ISE654.2	Recognize transport layer services and infer UDP and TCP protocols
21ISE654.3	Classify routers, IP and Routing Algorithms in network layer
21ISE654.4	Understand the fundamentals of TCP/IP, OSI layers and Addressing Scheme
21ISE654.5	Describe the basics of Multimedia Networking and its types.

Textbooks:

1. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson,2017.
2. Nader F Mir, Computer and Communication Networks, 2nd Edition, Pearson, 2014.

Reference books:

Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian Edition.

1. Larry L Peterson and Brusce S Davie, Computer Networks, fifth edition, ELSEVIER.
2. Andrew S Tanenbaum, Computer Networks, fifth edition, Pearson.
3. Mayank Dave, Computer Networks, Second edition, Cengage Learning.

MOOCs:

1. http://nptel.ac.in/
2. https://www.khanacademy.org/
3. E-learning: www.vtu.ac.in
4. https://www.classcentral.com/

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE654.1	3	2	2	-	-	-	-	1	1	-	-	2	-	3	-	-
21ISE654.2	3	2	2	-	-	-	-	1	1	-	-	2	1	3	-	-
21ISE654.3	3	2	2	-	-	-	-	1	1	-	-	2	1	-	-	3
21ISE654.4	3	2	2	-	-	-	-	1	1	-	-	2	-	3	-	-
21ISE654.5	3	2	2	-	-	-	-	1	1	-	-	2	-	3	-	1
Average	3	2	2	-	-	-	-	1	1	-	-	2	1	3	-	2

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Society Culture and Human Behavior

Semester:	**6**	**CIE Marks**	**50**
Course Code	**21ISE661**	**SEE Marks**	**50**
Hours/Week (L: T: P)	**1:0:0**	**Duration of SEE (hours):**	**3**
Type of Course	**AEC**	**Credits**	**1**

Course Learning Objectives:

CLO1	To provide the knowledge of Society as the base of Social Work.
CLO2	Understand the concept and meaning of culture; its importance and characteristics
CLO3	Understand the concept and meaning of culture; and establish relationship between culture and civilization
CLO4	Explore the Person in Environment Approach

Module 1	**No. of Hours RBT Level**
Society: Introduction, Types of Societies, Origin of Society, Characteristics of Society, Association, Difference between society and association.	**03 Hours L2**
Module 2	
Culture: Introduction, Concept of culture, Origin of culture, Components of Culture, culture and civilization, culture and heritage, Characteristics of culture, importance of cultural in human life, Beliefs, Values, Globalization and Cultural Diversity.	**03 Hours L2**
Module 3	
Indian culture: Introduction, Characteristics of Indian culture, cultural identity, religion, region and ethnicity, Ancient India, Religious reforms, tribal communities of India, spread of Indian Culture	**03 Hours L2**
Module 4	
Human behavior: Understanding human behavior, heredity and environment in shaping human behavior. Introduction to Psychology – Meaning, Goals. Basic psychological Process: Perception, Motivation and Intelligence. Nature and principles of human growth and development – stages of life span from conception to old age.	**03 Hours L2**

Course Outcomes: Upon successful completion of this course, student will be able to

21ISE661.1	Explain types of societies and its characteristics.
21ISE661.2	Explain Globalization and Cultural Diversity.
21ISE661.3	Explain various aspects of Indian Culture
21ISE661.4	Explain various psychological process along with shaping of the human behavior.

Reference Books:

1. Dr. Dilip Mishra, "Man and Society".
2. Lewis Holloway and Moya Kneafsey, "Geographies of Rural Cultures and Societies (Perspectives on Rural Policy and Planning)
3. Margarete Parrish, "Social Work Perspectives on Human Behaviour".
4. Anissa Rogers, " Human Behavior in the Social Environment: Perspectives on Development and the Life Course (New Directions in Social Work)"
5. Attkinson and Hillgard, "Psychology: An introduction", Cengage Press
6. Cacioppo, J, "Discovering Psychology", Cengage Learning
7. Morgan, King, Weiz and Schopler, "Introduction to Psychology", 7th Edition, New Delhi, TATA McGraw Hill.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE661.1	-	-	-	-	-	3	3	-	-	-	3	3	1	-	-	-
21ISE661.2	-	-	-	-	-	3	3	-	-	-	3	3	1	-	-	-
21ISE661.3	-	-	-	-	-	3	3	-	-	-	3	3	1	-	-	-
21ISE661.4	-	-	-	-	-	3	3	-	-	-	3	3	1	-	-	-
Average	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	1	**-**	-	-

Low-1: Medium-2: High-3

Semester – VI

Course: Financial Literacy and Banking

Semester:	**6**	**CIE Marks**	**50**
Course Code	**21ISE662**	**SEE Marks**	**50**
Hours/Week (L: T: P)	**1:0:0**	**Duration of SEE (hours):**	**3**
Type of Course	**AEC**	**Credits**	**1**

Course Learning Objectives:

Sl. No	Course Learning Objectives (CLO)
CLO1	Create a plan to create good money habits based on personality type and common external forces
CLO2	Compare features and costs of different banks and banking products (checking accounts, savings accounts, banks, credit unions, online banks)
CLO3	Recognize the importance of saving money for emergencies
CLO4	Explain the concept of insurance and identity different types of insurances

Module 1	No. of Hours RBT Level
Basics of Savings and Investment: Why are investing and savings important? Savings Vs Investment, Power of Compounding, What should be the investment objectives? Risk and Return, Inflation effects on Investment, Investor's Age and Assets Allocation. Tax saving SchemesGovernment Schemes-National Saving Certificates, Public Provident Fund, Post Office Schemes, Equity Linked Savings Schemes, Retirement Benefits Schemes- NPS (New Pension System)	**03 Hours** **L2**
Module 2	
Banking Activities: Deposits and Types of Deposits-Saving Bank Accounts, Fixed Deposit Accounts, Recurring Deposit Account, Special Term Deposit Schemes, Loans and Types of loan advanced by Banks and Other secondary functions of Bank. Banking structure in India and Role of Reserve Bank of India	**03 Hours** **L2**
Module 3	
Financial Markets: Capital Market Vs Money Market, Securities and its types, i.e., Equity, Debentures or Bonds, IPOs and FPOs, Mutual Funds, Types of Mutual Funds, Brokers, sub-brokers, Process for becoming a capital market investor.	**03 Hours** **L2**
Module 4	
Protection Related products: Insurance Policies, Life Insurance, Term Life Insurance, Endowment Policies, Pension Policies, ULIP, Health Insurance and its Plans, Understanding of Ponzi Scheme	**03 Hours** **L2**

Course Outcomes: Upon successful completion of this course, student will be able to

21ISE662.1	Understand the importance of savings and investment
21ISE662.2	Explain various banking activities and role of RBI.
21ISE662.3	Understand the money management industry and its key players: pension funds, mutual funds etc
21ISE662.4	Compare and contrast the types of life assurance available in the market

Reference Books:

1. Investment Planning by SEBI
2. Indian financial System, by T. R. Jain and R. L .Sharma, VK Global Publisher
3. Money and Banking by T. R. Jain and R. K. Kaundal, VK Global Publisher

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE662.1	-	-	-	-	-	-	-	-	-	-	3	3	-	-	-	-
21ISE662.2	-	-	-	-	-	-	-	-	-	-	3	3	-	-	-	-
21ISE662.3	-	-	-	-	-	-	-	-	-	-	3	3	-	-	-	-
21ISE662.4	-	-	-	-	-	-	-	-	-	-	3	3	-	-	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	-	-

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Environmental Science

Course Code	21CIV67	CIE Marks	50
Hours/Week (L: T: P)	1:0:0	SEE Marks	50
No. of Credits	1	Examination Hours	1 hour

Course Learning Objectives:

CLO1	The fundamentals of environmental science.
CLO2	The types of natural resources
CLO3	The various global environmental concerns.
CLO4	The types of wastes generated and their handling at a basic level
CLO5	The area of environmental law and policies with a few important acts in the field

Content	No. of Hours/ RBT Levels
Module 1 **Environment:** • Definition, scope & importance • Components of Environment Ecosystem: Structure and function of various types of ecosystems • Human Activities – Food, Shelter, and Economic & Social Security. • Population - Growth, variation among nations – population explosion and impact on environment **Biodiversity:** Types, Value; Hot spots; Threats and Conservation of biodiversity, Forest Wealth, and Deforestation.	**04 Hours / L2**
Module 2 **Natural Resources**: Forest, Water, Mineral, Food, Energy, Land Environmental Pollution - Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards.	**04 Hours / L2**
Module 3 **Global Environmental Concerns** (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology.	**04 Hours / L2**
Module 4 **Sources:** Sources of Solid waste, Types of solid waste, Physical and Chemical composition of municipal solid waste. Solid Waste Management Rules in India Sources and management of E – Waste, Biomedical Waste, Hazardous waste, and construction waste at individual and community level. Socio-economic aspect of waste management Environmental Toxicology.	**04 Hours / L2**
Module 5 **Latest Developments in Environmental Pollution Mitigation Tools** (Concept and Applications): Environment Impact Assessment, Environmental Management Systems, ISO14001; Environmental Stewardship, NGOs.	**04 Hours / L2**

COURSE OUTCOMES: Upon completion of this course, student will be able to:

21CIV67.1	Understand holistically the key concepts "Environment", and "Biodiversity".
21CIV67.2	Classify the types of natural resources available and the effects of anthropogenic interventions.
21CIV67.3	Express the gravity of various global environmental concerns.
21CIV67.4	Categorize the types of wastes generated and their handling at a basic level.
21CIV67.5	Understand the importance of environmental law and policies.

Textbooks:

1. Environmental studies, Benny Joseph, Tata Mcgraw-Hill 2nd edition 2012
2. Environmental studies, S M Prakash, pristine publishing house, Mangalore 3rd edition-2018
3. Gilbert M.Masters, Introduction to Environmental Engineering and Science, 2nd edition, Pearson Education, 2004

Reference books:

1. Benny Joseph, Environmental studies, Tata Mcgraw-Hill 2nd edition 2009
2. M.Ayi Reddy Textbook of Environmental Science and Technology, BS publications 2007
3. Dr. B.S Chauhan, Environmental Studies, University of science press 1st edition

Web References:

https://www.hzu.edu.in/bed/E%20V%20S.pdf

https://onlinecourses.nptel.ac.in/noc23_hs155/preview

https://onlinecourses.swayam2.ac.in/cec19_bt03/preview

Scheme of Examination:

Semester End Examination (SEE): SEE Question paper is to be set for 50 marks with multiple choice questions of 1 mark each covering all aspects of the syllabus.

Continuous Internal Evaluation (CIE): Three Tests are to be conducted for 50 marks each. The average of the three tests are taken for computation of CIE. Question paper for each of the CIE is to be of the multiple-choice type with 50 question each.

Typical Evaluation pattern for regular courses is shown in Table.

Table 1: Distribution of weightage for CIE & SEE for 1 credit course

	Component	Marks	Total Marks
CIE	CIE Test-1	**50**	**50**
	CIE Test-2	**50**	
	CIE Test-2	**50**	
SEE	Semester End Examination	**50**	**50**
		Grand Total	**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21CIV67.1	2	-	-	-	-	-	3	-	-	-	-	-	1	-	-
21CIV67.2	2	1	-	-	-	-	3	-	-	-	-	1	1	-	1
21CIV67.3	2	-	2	-	-	2	3	1	-	-	-	1	1	-	1
21CIV67.4	2	2	-	-	-	2	3	-	-	-	-	-	-	-	1
21CIV67.5	2	-	-	-	-	2	3	-	-	-	-	-	-	1	1
Average	**2**	**1.5**	**2**	**-**	**-**	**2**	**3**	**1**	**-**	**-**	**-**	**1**	**1**	**1**	**1**

Low-1: Medium-2: High-3

SEMESTER – VI

Course: Universal Human Values

Course Code	21UHV67	CIE Marks	50
Hours/Week (L: T: P)	1:0:0	SEE Marks	50
No. of Credits	1	Examination Hours	1 hour

Course Learning Objectives:

CLO1	To create an awareness on Engineering Ethics and Human Values.
CLO2	To understand social responsibility of an engineer.
CLO3	To appreciate ethical dilemma while discharging duties in professional life.

Content	No. of Hours
Module 1 **Introduction to Value Education** • Value Education, Definition, Concept and Need for Value Education. • The Content and Process of Value Education. • Basic Guidelines for Value Education, • Self-exploration as a means of Value Education. • Happiness and Prosperity as parts of Value Education.	**05 Hours**
Module 2 **Harmony in the Human Being** • Human Being is more than just the Body. • Harmony of the Self ('I') with the Body. • Understanding Myself as Co-existence of the Self and the Body. • Understanding Needs of the Self and the needs of the Body. • Understanding the activities in the Self and the activities in the Body.	**05 Hours**
Module 3 **Harmony in the Family and Society and Harmony in the Nature** • Family as a basic unit of Human Interaction and Values in Relationships. • The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory, Gratitude and Love, • Comprehensive Human Goal: The Five Dimensions of Human Endeavour. • Harmony in Nature: The Four Orders in Nature. • The Holistic Perception of Harmony in Existence.	**05 Hours**
Module 4 **Social Ethics** • The Basics for Ethical Human Conduct, Defects in Ethical Human Conduct. • Holistic Alternative and Universal Order, • Universal Human Order and Ethical Conduct. • Human Rights violation and Social Disparities.	**05 Hours**
Module 5 **Professional Ethics** • Value based Life and Profession., Professional Ethics and Right Understanding. • Competence in Professional Ethics. • Issues in Professional Ethics – The Current Scenario. • Vision for Holistic Technologies • Production System and Management Models.	**05 Hours**

COURSE OUTCOMES: Upon completion of this course, student will be able to:

21UHV67.1	Understand the significance of value inputs in a classroom and start applying them intheir life and profession
21UHV67.2	Distinguish between values and skills, happiness and accumulation of physical facilities,the Self and the Body, Intention and Competence of an individual, etc.
21UHV67.3	Understand the role of a human being in ensuring harmony in society and nature.
21UHV67.4	Distinguish between ethical and unethical practices and start working out the strategy toactualize a harmonious environment wherever they work.

Textbooks:

1.A.N Tripathy, New Age International Publishers, 2003. 2.Bajpai.
B. L, New Royal Book Co, Lucknow, Reprinted, 2004 3.Bertrand
Russell Human Society in Ethics & Politics

Reference books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Corliss Lamont, Philosophy of Humanism.
4. Gaur. R.R. , Sangal. R, Bagari G.P, A Foundation Course in Value Education,Excel Books, 2009.
5. Gaur. R.R. , Sangal R , Bagaria G.P, Teachers Manual, Excel Books, 2009.
6. I.C. Sharma, Ethical Philosophy of India, Nagin & co, Julundhar
7. William Lilly- Introduction to Ethics -Allied Publisher

Scheme of Examination:

Semester End Examination (SEE): SEE Question paper is to be set for 50 marks with multiple choice questions of 1 mark each covering all aspects of the syllabus.

Continuous Internal Evaluation (CIE): Three Tests are to be conducted for 50 marks each. The average of the three tests are taken for computation of CIE. Question paper for each of the CIE is to be of the multiple-choice type with 50 question each.

Typical Evaluation pattern for regular courses is shown in Table.

Table 1: Distribution of weightage for CIE & SEE for 1 credit course

	Component	Marks	Total Marks
CIE	CIE Test-1	**50**	**50**
	CIE Test-2	**50**	
	CIE Test-2	**50**	
SEE	Semester End Examination	**50**	**50**
		Grand Total	**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21UHV67.1	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
21UHV67.2	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
21UHV67.3	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
21UHV67.4	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**

Low-1: Medium-2: High-3

7th Semester Syllabus

SEMESTER – VII

Course: Cyber Security & Ethical Hacking

Course Code	21ISE71	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Data Communications, Computer Networks

Course Learning Objectives:

CLO1	Understand the concepts of cyber-attacks, threats and security.
CLO2	Illustrate the security incidents for investigation.
CLO3	Explore various techniques used to for insecure web application
CLO4	Discuss relevant techniques for Vulnerability testing
CLO5	Demonstrate the SQL Injection using advanced security measure.

Content	No.of Hours/ RBT levels
Module 1 **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	**08 Hours L2**
Module 2 **Cyberspace and the Law & Cyber Forensics**: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. 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	**08Hours L2**
Module 3 **Ethical Hacking - Introduction:** Understanding the importance of security, Concept of ethical hacking and essential Terminologies-Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking, Foot printing, Scanning, System Hacking, Session Hijacking.	**08 Hours L2**
Module 4 **Sniffers:** Active and passive sniffing. ARP poisoning and countermeasures. Man in the middle attacks, Spoofing and Sniffing attacks. Sniffing countermeasures.	**08 Hours L3**
Module 5 **SQL Injection:** Attacking SQL Servers, Sniffing, Brute Forcing and finding Application Configuration Files, Input validation attacks. Preventive Measures. Web Application Threats, Web Application Hacking, Cross Site Scripting / XSS Flaws / Countermeasures Correct Web Application Set-up.	**08 Hours L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE71.1	Understand cyber-attacks, types of cybercrimes, cyber laws and the protection measures.
21ISE71.2	Interpret and forensically investigate security incidents
21ISE71.3	Analyse the techniques used to break into an insecure web application
21ISE71.4	Identify relevant countermeasures for evaluating the Vulnerability
21ISE71.5	Demonstrate the evaluation of SQL Injection using advanced security measure.

Textbooks:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B.B.Gupta, D.P.Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335,2018.
3. Patrick Engebretson, The Basics of Hacking and Penetration Testing, Elsevier, 2013.
4. Network Security and Ethical Hacking, Rajat Khare, Luniver Press, 2006.

Reference books:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRCPress.
2. Network intrusion alert: an ethical hacking guide to intrusion detection, Ankit Fadia, Manu Zacharia, Thomson Course Technology PTR, 2007.
3. Ethical Hacking, Thomas Mathew, OSB Publisher, 2003.
4. Hacking Exposed: Network Security Secrets & Solutions, Stuart McClure, Joel Scambray and George Kurtz, McGraw-Hill, 2005.

MOOCs:

1. https://www.coursera.org/courses?query=ethical%20hacking
2. https://onlinecourses.nptel.ac.in/noc19_cs68/preview

Scheme of Examination:
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE71.1	2	2	-	-	1	1	-	1	1	1	-	3	1	-	1	-
21ISE71.2	2	2	-	-	1	1	-	1	1	1	-	3	1	-	1	-
21ISE71.3	2	2	-	1	1	1	-	1	1	1	-	3	1	1	2	-
21ISE71.4	2	2	-	-	1	1	-	1	1	1	-	3	1	-	1	-
21ISE71.5	2	2	-	-	1	1	-	1	1	1	-	3	1	-	1	-
Average	2	2	-	1	1	1	-	1	1	1	-	3	1	1	1	-

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Deep Learning (Integrated)

Course Code	21ISE72	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	4	Examination Hours	3

Prerequisites: Machine Learning Basics

Course Learning Objectives:

CLO1	Understand the fundamentals of deep learning.
CLO2	Know the theory behind Convolutional Neural Networks, Autoencoders, RNN.
CLO3	Illustrate the strength and weaknesses of many popular deep learning approaches.
CLO4	Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.

Content	No.of Hours/ RBT levels
Module 1 **Introduction to Deep Learning:** Introduction, Deep learning Model, Historical Trends in Deep Learning, **Machine Learning Basics:** Learning Algorithms, Supervised Learning Algorithms, Unsupervised Learning Algorithms. **Textbook 1: Chapter1 – 1.1, 1.2, 5.1,5.7-5.8.**	**10 Hours L2**
Module 2 **Feedforward Networks**: Introduction to feed forward neural networks, Gradient-Based Learning, Back Propagation and Other Differentiation Algorithms. Regularization for Deep Learning, **Textbook 1: Chapter 6, 7**	**10 Hours L3**
Module 3 **Optimization for Training Deep Models:** Empirical Risk Minimization, Challenges in Neural Network Optimization, **Basic Algorithms:** Stochastic Gradient Descent, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates: The AdaGrad algorithm, The RMSProp algorithm, Choosing the Right Optimization Algorithm. **Textbook 1: Chapter: 8.1-8.5**	**10 Hours L3**
Module 4 **Convolutional Networks:** The Convolution Operation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features- LeNet, AlexNet. **Textbook 1: Chapter: 9.1-9.9.**	**10 Hours L3**

Module 5	
Recurrent and Recursive Neural Networks: Unfolding Computational Graphs, Recurrent Neural Network, Bidirectional RNNs, Deep Recurrent Networks, Recursive Neural Networks, The Long Short Term Memory and Other Gated RNNs. **Applications:** Large-Scale Deep Learning, Computer, Speech Recognition, Natural Language Processing and Other Applications. **Textbook 1: Chapter: 10.1-10.3, 10.5, 10.6, 10.10, 12.**	**10 Hours** **L3**

Program List	
1	Build a deep neural network model start with linear regression using a single variable.
2	Build a deep neural network model start with linear regression using multiple variables.
3	Build a feed forward neural network for prediction of logic gates.
4	Write a program for character recognition using CNN.
5	Write a program for character recognition using RNN and compare it with CNN.
6	Write a program to convert speech into text.
7	Write a program to convert text into speech.
8	Write a program for Time-Series Forecasting with the LSTM Model.
9	Write a program to predict a caption for a sample image using LSTM.
10	Write a program to develop a GAN for Generating MNIST Handwritten Digits.

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE72.1	Understand the fundamental issues and challenges of deep learning data, model selection, model complexity etc.,
21ISE72.2	Describe various knowledge on deep learning and algorithms
21ISE72.3	Apply CNN and RNN model for real time applications
21ISE72.4	Identify various challenges involved in designing and implementing deep learning algorithms.
21ISE72.5	Relate the deep learning algorithms for the given types of learning tasks in varied domain

Textbooks:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.

Reference books:

1. Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning, 2009.

2. N.D.Lewis, “Deep Learning Made Easy with R: A Gentle Introduction for Data Science”, January 2016.

3.Nikhil Buduma, “Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms”, O’Reilly publications.

4. Navin Kumar Manaswi ,Deep Learning with Applications Using Python Chatbots and Face, Object, and Speech Recognition With TensorFlow and Keras ,Apress,2018.

MOOCs:

1. https://nptel.ac.in/courses/106106184
2. https://faculty.iitmandi.ac.in/~aditya/cs671/index.html

Scheme of Examination:

Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**
Continuous Internal Evaluation (CIE):
Three Tests for theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Two lab CIE is conducted for 20 marks each and average is added to theory component.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test- 3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE72.1	3	3	3	2	2	-	-	-	-	-	2	-	2	-	-	-
21ISE72.2	3	3	3	2	2	-	-	-	-	-	2	-	2	-	-	-
21ISE72.3	3	3	3	2	2	-	-	-	-	-	2	-	2	-	-	-
21ISE72.4	3	3	3	2	2	-	-	-	-	-	2	-	2	-	-	-
21ISE72.5	3	3	3	2	2	-	-	-	-	-	2	-	2	-	-	-
Average	3	3	3	2	2	-	-	-	-	-	2	-	2	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Big Data Analytics (Integrated)

Course Code	21ISE73	CIE Marks	50
Hours/Week (L: T: P)	3:0:2	SEE Marks	50
No. of Credits	4	Examination Hours	100

Course Learning Objectives:

CLO1	Understand the fundamentals of Big Data Analytics
CLO2	Explore the Hadoop framework and Hadoop Distributed File system
CLO3	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data
CLO4	Employ MapReduce programming model to process the big data
CLO5	Understand various machine learning algorithms for Big Data Analytics, Web Mining and Social Network Analysis.

Contents	No. of Hours / RBT level
Module 1 **Introduction to Big Data Analytics:** Big Data, , Designing Data Architecture, Hadoop Distributed File System Basics : HDFS Design Features, Components, HDFS User Commands, Map Reduce Framework and Programming Model, Hadoop Yarn, Hadoop Ecosystem Tools ,Managing Hadoop with Apache Ambari, Basic Hadoop Administration Procedures	**8 Hours L2**
Module 2 **NoSQL Big Data Management**, MongoDB and Cassandra: Introduction, NoSQL Data Store, NoSQL Data Architecture Patterns, NoSQL to Manage Big Data, Shared-Nothing Architecture for Big Data Tasks, MongoDB, Databases, Cassandra Databases	**8 Hours L2**
Module 3 **MapReduce, Hive and Pig:** Introduction, MapReduce Map Tasks, Reduce Tasks and MapReduce Execution, Composing MapReduce for Calculations and Algorithms, Hive, HiveQL, Pig.	**8 Hours L2**
Module 4 **Machine Learning Algorithms for Big Data Analytics:** Introduction, Estimating the relationships, Outliers, Variances, Probability Distributions, and Correlations, Regression analysis, Finding Similar Items, Similarity of Sets and Collaborative Filtering, Frequent Itemsets and Association Rule Mining	**8 Hours L2**

Module 5	
Text, Web Content, Link, and Social Network Analytics: Introduction, Text mining, Web Mining, Web Content and Web Usage Analytics, Page Rank, Structure of Web and analyzing a Web Graph, Social Network as Graphs and Social Network Analytics	**8 Hours L2**

Experiment Name	
PART A –Hadoop	
	Install, configure and run Hadoop and HDFS.
1	Implement word count/frequency programs using MapReduce from a given input file.
2	Implement an MR program that processes a weather dataset.
3	Implement a Map reduce program for printing maximum salary for a given input file.
4	Implement map reduce concepts for printing year wise sales from a given csv file.
5	Implement Map reduce program to return the cost of the item that is most expensive, for each location.
	PART B –Data Analytics
6	Implement Linear and logistic Regression.
7	Implement SVM considering a Sample Dataset.
8	Implement KMeans & DBSCAN algorithm using appropriate Data sets
9	Implement OPTICS algorithm using appropriate Data sets.
10	Visualize data using any plotting framework.

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE73.1	Understand the fundamentals of Big Data Analytics and its applications.
21ISE73.2	Describe Hadoop and its ecosystem and Hadoop Distributed File system.
21ISE73.3	Demonstrate the concepts of NoSQL using MongoDB and Cassandra Databases for Big Data.
21ISE73.4	Illustrate the MapReduce programming model to process the big data along with Hadoop tools.
21ISE73.5	Apply the knowledge of Hadoop framework, HDFS, MongoDB, Casandra, Machine learning algorithms in solving the real world problems associated with Big Data.

Textbooks:

1. Raj Kamal and Preeti Saxena, “Big Data Analytics Introduction to Hadoop, Spark, and Machine-Learning”, McGraw Hill Education, 2018 ISBN: 9789353164966, 9353164966
2. Douglas Eadline, "Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem", 1 stEdition, Pearson Education, 2016. ISBN13: 978-9332570351

Reference books:

1. Tom White, “Hadoop: The Definitive Guide”, 4th Edition, O‟Reilly Media, 2015.ISBN-13: 978-9352130672 2.
2. Boris Lublinsky, Kevin T Smith, Alexey Yakubovich, "Professional Hadoop Solutions", 1 stEdition, Wrox Press, 2014ISBN-13: 978-8126551071
3. Eric Sammer, "Hadoop Operations: A Guide for Developers and Administrators",1 stEdition, O'Reilly Media, 2012.ISBN-13: 978-9350239261
4. Arshdeep Bahga, Vijay Madisetti, "Big Data Analytics: A Hands-On Approach", 1st Edition, VPT

Publications, 2018. ISBN-13: 978-0996025577

MOOCs:

1. http://nptel.ac.in/
2. https://www.khanacademy.org/
3. E-learning: www.vtu.ac.in
4. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
5. https://www.classcentral.com/course/big-data-analytics-18252

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests for theory component are to be conducted for 40 marks each. Marks scored in each test is reduced to 30. Lab CIE is conducted for 20 marks and is added to theory component**.**

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**30**	**50**
	CIE Test-2	**30**	
	CIE Test- 3	**30**	
	Laboratory	**20**	
SEE	Semester End Examination	**100**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE73.1	3	2	2	2	1	1	-	1	-	-	-	2	-	3	-	-
21ISE73.2	3	2	2	2	1	1	-	1	-	-	-	2	1	3	-	-
21ISE73.3	3	2	2	2	1	1	-	1	-	-	-	2	1		-	3
21ISE73.4	3	2	2	2	1	1	-	1	-	-	-	2	-	3	-	-
21ISE73.5	3	2	2	2	1	1	-	1	-	-	-	2	-	3	-	1
Average	3	2	2	2	1	1	-	1	-	-	-	2	1	3	-	2

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Mobile Communication

Course Code	21ISE741	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Prerequisites: Data Communications

Course Learning Objectives:

CLO1	Understand the basic concepts of mobile computing
CLO2	Understand Wireless LAN, Bluetooth and Wi-Fi Technologies
CLO3	Be familiar with the network protocol stack
CLO4	Learn the basics of mobile telecommunication system
CLO5	Be exposed to Ad-Hoc networks

Content	No. of Hours/ RBT levels
Module 1 **Introduction:** Introduction to Mobile Computing — Applications of Mobile Computing- Generations of Mobile Communication Technologies-MAC Protocol: SDMA- TDMA- FDMA- CDMA	**08 Hours L2**
Module 2 **Mobile Telecommunication System:** GSM Architecture Protocols Connection Establishment Frequency Allocation Routing Mobility Management Security GPRS, UMTS Architecture	**08Hours L3**
Module 3 **Wireless Networks:** Wireless LANs and PANs, IEEE 802.11 Standard, Architecture Services, Blue Tooth, Wi-Fi, WiMAX	**08 Hours L3**
Module 4 **Mobile Network Layer:** Mobile IP, DHCP Ad Hoc, Proactive and Reactive Routing Protocols, Multicast Routing, Vehicular Ad Hoc networks (VANET), MANET Vs VANET, Security	**08 Hours L3**
Module 5 **Mobile Transport and Application Layer:** Mobile TCP, WAP, Architecture, WTLS, WTP, WSP, WAE, WTA Architecture and WML	**08 Hours L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE741.1	Explain the basics of mobile telecommunication system
21ISE741.2	Illustrate the generations of telecommunication systems in wireless network
21ISE741.3	Understand the architecture of Wireless LAN technologies
21ISE741.4	Determine the functionality of network layer and identify a routing protocol for a given Ad hoc networks
21ISE741.5	Explain the functionality of Transport and Application layer

Textbooks:

1. Jochen Schiller, —Mobile Communications‖, PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, —Fundamentals of Mobile Computing‖, PHI Learning Pvt.Ltd, New Delhi – 2012

Reference books:

1. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, —Principles of Mobile Computing‖, Springer, 2003.
3. William.C.Y. Lee, —Mobile Cellular Telecommunications-Analog and Digital Systems‖, Second Edition, Tata Mc Graw Hill Edition ,2006.

MOOCs:

https://www.mooc-list.com/tags/mobile-communications
https://onlinecourses.nptel.ac.in › noc21_ee66

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE741.1	3	2	3	-	-	-	-	-	-	-	-	1	-	-	-	-
21ISE741.2	3	2	3	-	-	-	-	-	-	-	-	1	-	-	-	-
21ISE741.3	3	2	3	-	-	-	-	-	-	-	-	1	-	-	-	-
21ISE741.4	3	2	3	-	-	-	-	-	-	-	-	1	-	-	-	-
21ISE741.5	3	2	3	-	-	-	-	-	-	-	-	1	-	-	-	-
Average	3	2	3	-	-	-	-	-	-	-	-	1	-	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VII
Course: Software Testing

Course Code	**21ISE742**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**3:0:0**	**SEE Marks**	**50**
No. of Credits	**3**	**Examination Hours**	**03**

Prerequisites: Software Engineering

Course Learning Objectives:

CLO1	Understanding the basic fundamentals of testing, verification and validation methods and techniques.
CLO2	Apply software testing concepts and methodologies to a variety of testing scenarios.
CLO3	Perform software inspection and program analysis
CLO4	Develop and apply continuous verification and validation methods

Content	**No. of Hours/ RBT levels**
Module 1 **Software Testing:** Software Quality, Role of Testing, Verification and Validation, Failure, Error, Fault, and Defect, Notion of Software Reliability, Objectives of Testing, What Is a Test Case?, Expected Outcome, Concept of Complete Testing, Central Issue in Testing , Testing Activities, Test Levels, Sources of Information for Test Case Selection, White-Box, Black-Box and Gray-Box Testing, Test Planning and Design, Monitoring and Measuring Test Execution, Test Tools and Automation, Test Team Organization and Management Basic Definitions, Test Cases, Insights from a Venn Diagram, Identifying Test Cases, Specification-Based Testing, Code-Based Testing, Specification Based versus Code-Based Debate, Fault Taxonomies. Example Triangle Problem.	**08 Hours L2**
Module 2 **Unit Testing:** Concept of Unit Testing, Static Unit Testing, Defect Prevention, Dynamic Unit Testing, Mutation Testing, Debugging, Unit Testing in extreme Programming. Boundary Value Testing- Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary Value Testing, Test Cases for the Triangle Problem, Random Testing. Equivalence Class Testing- Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Equivalence Class Test Cases for the Triangle Problem.	**08 Hours L3**
Module 3 **Data Flow Testing:** General Idea, Data Flow Anomaly, Overview of Dynamic Data Flow Testing, Data Flow Graph, Data Flow Terms, Data Flow Testing Criteria, Comparison of Data Flow Test Selection Criteria **Object-Oriented Testing**: Object-Oriented Unit Testing, Object-Oriented Integration Testing, Object-Oriented System Testing.	**08 Hours L3**

Module 4 **Software Quality:** Five Views of Software Quality, McCall's Quality Factors and Criteria, ISO 9126 Quality Characteristics, ISO 9000:2000 Software Quality Standard **Software Verification:** Inspection process, Applying the Inspection Process: Attributes of a Good Process, Requirements Inspections, Design Inspection, Code Inspection, Test Script Inspection, Software quality Metric: Strategy, Framework, Metrics Configuration Management: Basics, Identification, Baseline Management, Auditing and Reporting.	**08 Hours L3**
Module 5 **Software Validation:** Testing: Validation Testing Model, Test Planning Validation Metrics: Time Measures, Test Coverage Metrics, Quality Metrics, Software reliability growth: Test Analyze Fix Process, Reliability Growth Modeling. **Acceptance Testing:** What Is User Acceptance Testing? When Is It Performed? Who Performs UAT? Need for User Acceptance Testing, User Acceptance Testing Process, UAT Test Planning, User Acceptance Testing Design, Test Execution. Case Study: JUnit Tools/Selenium	**08 Hours L3**

COURSE OUTCOMES:
On completion of the Course, student will be able to

21ISE742.1	Understand the significance of the basics testing, verification and validation techniques.
21ISE742.2	Apply the concepts related to software verification and validation
21ISE742.3	Identify different testing Technique and design test plans, develop test suits and evaluate test suit coverage.
21ISE742.4	Use testing Frame work and Testing tools

Text Books:

1. Software Testing And Quality Assurance Theory And Practice – 2nd Edition, Kshirasagar Naik And Priyadarshi Tripathy, 2008.
2. Software Testing, A Craftsman's Approach, C Paul C. Jorgensen, Auerbach Publications, 4th Edition, 2014
3. Software Verification and Validation for Practitioners and Managers, Rakitin R. S., Artech House (2001), 2nd ed.
4. https://www.softwaretestinghelp.com/what-is-user-acceptance-testing-uat/

Reference Books:

1. Foundations of Software Testing, Aditya P Mathur, Pearson, 2008.
2. Software Testing and Analysis – Process, Principles and Techniques, Mauro Pezze, Michal Young, John Wiley & Sons, 2008

MOOCS

1. https://nptel.ac.in/courses/106/105/106105150/
2. https://nptel.ac.in/courses/106/101/106101163/

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each dule carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE742.1	3	3	3	3	-	-	-	-	-	-	-	3	3	-	-	-
21ISE742.2	3	3	3	3	-	-	-		-	-	-	3	3	-	-	-
21ISE742.3	3	3	3	3	-	-	-	2	-	-	-	3	3	-	-	-
21ISE742.4	3	3	3	3	3	-	-	2	-	-	-	3	3	-	-	-
Average	3	3	3	3	3	-	-	2	-	-	-	3	3	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VII

Course: User Interface Design

Course Code	21ISE743	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Knowledge of WEB Programming

Course Learning Objectives:

CLO1	To study the concept of good design in web and graphical user interface design
CLO2	Acquire the knowledge on user interface design process and business functions.
CLO3	To study the characteristics and components of windows and the various controls for the windows.
CLO4	To study about various problems in windows design with color, text, graphics.
CLO5	To study the prototyping and testing methods.

Content	No.of Hours/ RBT levels
Module 1 The User Interface-Introduction, Overview, The importance of user interface Defining the user interface, The importance of Good design, Characteristics of graphical and web user interfaces, Principles of user interface design. **Textbook 1: Ch. 1,2**	**08 Hours L2**
Module 2 The User Interface Design process- Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, Business Functions-Business definition and requirement analysis, Basic business functions, Design standards. **Textbook 1: Part-2**	**08Hours L3**
Module 3 System menus and navigation schemes- Structures of menus, Functions of menus, Contents of menus, Formatting of menus, Phrasing the menu, selecting menu choices, Navigating menus, Kinds of graphical menus. **Textbook 1: Part-2**	**08 Hours L3**
Module 4 Windows - Characteristics, Components of window, Window presentation styles, Types of windows, Window management, organizing window functions, Window operations, Web systems, Characteristics of device-based controls. **Textbook 1: Part-2**	**08 Hours L3**
Module 5 Screen based controls- Operable control, Text control, Selection control, Custom control, Presentation control, Windows Tests-prototypes, kinds of tests. **Textbook 1: Part-2**	**08 Hours L3**

Mini-Projects/ Case Study as Assignment:
Choose and develop a real time application using open-source tool to apply some features of the user interface design concepts learnt.

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE743.1	Understand the principles of usability, structure of menus and windows to design user interface.
21ISE743.2	Apply the user interface concepts on business functions, menus, and windows functions in designing
21ISE743.3	Analyze human interaction speed, menu contents and windows presentation styles
21ISE743.4	Analyze the significance of good design, device based and screen-based controls
21ISE743.5	Analyze the prototypes and test plans of user interface in real time application

Textbooks:

1. Wilbert O, Galitz, "The Essential Guide to User Interface Design", John Wiley & Sons, Second Edition 2002

Reference books:

1. Ben Sheiderman, "Design the User Interface", Pearson Education, 1998

2. Alan Cooper, " The Essential of User Interface Design", Wiley-Dream Tech Ltd.,2002

MOOCs: https://www.coursera.org/professional-certificates/google-ux-design

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.
Typical Evaluation pattern for regular courses is shown in Table 2.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE743.1	3	3	-	-	3	-	-	-	-	-	-	2	3	-	2	-
21ISE743.2	3	3	-	-	3	-	-	-	-	-	2	2	3	-	2	-
21ISE743.3	3	3	-	-	3	-	-	-	-	-	-	2	3	-	2	-
21ISE743.4	3	3	-	-	3	-	-	-	-	-	2	2	3	-	2	-
21ISE743.5	3	3	-	-	3	-	-	-	-	-	-	2	3	-	2	-
Average	3	3	-	-	3	-	-	-	-	-	2	2	3	-	2	-

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Storage Area Networks

Course Code	21ISE744	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Prerequisites: Computer Networks, Operating System, Computer Organization

Course Learning Objectives:

CLO1	Understand meaning and need of storage area network
CLO2	Explore various applications of SAN
CLO3	Gather information about Software for Storage Networking
CLO4	Understand SAN Implementation Strategies

Content	No. of Hours/ RBT levels
Module 1 **Introduction:** What Is a Storage Area Network? Why Connect Storage to a Network? Storage and Processing, A Couple of Closing Clarifications, Ten Ways the SAN Paradigm Shift Changes Information Processing for the Better **Text Book-1: Chapter1,2**	**08 Hours L2**
Module 2 **Killer Apps for SANs-1:** Backup—The Application Everyone Loves to Hate, Highly Available Data, Disaster Recoverability **Text Book-1: Chapter 4**	**08Hours L3**
Module 3 **Killer Apps for SANs-2 and NAS:** Clusters—Continuous Computing, Data Replication, Network Storage Systems **Text Book-1: Chapter 4, 5**	**08 Hours L3**
Module 4 **Software for Storage Networking:** Software for SANs, Shared Access Data Managers, Computer System I/O Performance, Volumes: Resilience, Performance, and Flexibility, File Systems and Application Performance **Text Book-1: Chapter 8**	**08 Hours L2**
Module 5 **SAN Implementation Strategies:** Why Adopt Storage Networking? Developing a SAN Deployment Strategy, Nine Steps to Successful SAN Deployment, Critical Success Factors, SAN Adoption Alternatives **Text Book-1: Chapter 11**	**08 Hours L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE744.1	Explain basic concepts of Storage Area Network
21ISE744.2	Make use of various Backup, Highly available data and Disaster Recoverability techniques to safeguard the storage system
21ISE744.3	Make use of various Clusters—Continuous Computing, Data Replication, Network Storage Systems to safeguard the storage system
21ISE744.4	Outline various software used of Storage Networking
21ISE744.5	Interpret different SAN Implementation Strategies

Textbooks:

1. **"Storage Area Network Essentials-** A Complete Guide to Understanding and Implementing SANs" by Richard Barker, Paul Massiglia , Wiley Computer Publishing

Reference books:

1. **"Introduction to Storage Area Networks"** by Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel, Libor Miklas 9th Edition (December 2017), REDBOOK, IBM

MOOCs:

1. Storage Area Networking Fundamentals by IBM- https://www.ibm.com/training/course/SN71G
2. Storage Area Network with OpenfilerLinuxBuild - Udemy - https://www.udemy.com/course/build-your-own-san-storage/
3. Storage Area Network with Oracle ZFS on Centos Linux : L2- Udemy- https://www.udemy.com/course/storage-area-network-with-oracle-zfs-on-centos-linux-l2/

Scheme of Examination

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE744.1	3	3	-	-	-	-	-	-	-	-	-	2	-	2	-	-
21ISE744.2	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-	-
21ISE744.3	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-	-
21ISE744.4	3	3	-	-	-	-	-	-	-	-	-	2	-	2	-	-
21ISE744.5	3	3	-	-	-	-	-	-	-	-	-	2	-	2	-	-
Average	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**-**	**-**

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Introduction to Artificial Intelligence

Course Code	**21ISE751**	**CIE Marks**	**50**
Hours/Week (L: T: P)	**3:0:0**	**SEE Marks**	**50**
No. of Credits	**3**	**Examination Hours**	**03**

Prerequisites: Basics of Algorithms

Course Learning Objectives:

CLO1	Identify the problems where AI is required and the different methods available
CLO2	Compare and contrast different AI techniques available.
CLO3	Define and explain learning algorithms

Content	No.of Hours/ RBT levels
Module 1 **Introduction**: What is artificial intelligence? Problems, problem spaces and search	**08 Hours L2**
Module 2 **Knowledge Representation** : Knowledge Representation Issues, Using Predicate Logic, Representing knowledge using Rules	**08 Hours L2**
Module 3 **Reasoning** : Symbolic Reasoning under Uncertainty, Statistical reasoning	**08 Hours L2**
Module 4 **Natural Language Processing** : Game Playing, Natural Language Processing	**08 Hours L2**
Module 5 **Expert Systems** : Learning, Expert Systems	**08 Hours L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE751.1	Identify problems that can be solved by AI methods
21ISE751.2	Explain the way of representation of knowledge
21ISE751.3	Apply reasoning techniques to solve the AI problems
21ISE751.4	Interpret natural language processing, various learning techniques and expert systems

Textbooks:

1. E. Rich , K. Knight & S. B. Nair - Artificial Intelligence, 3/e, McGraw Hill.

Reference books:

1. Artificial Intelligence: A Modern Approach, Stuart Rusell, Peter Norving, Pearson Education 2nd Edition.
2. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems – Prentice Hal of India.
3. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem Solving", Fourth Edition, Pearson Education, 2002.
4. Artificial Intelligence and Expert Systems Development by D W Rolston-Mc Graw hill.
5. N.P. Padhy "Artificial Intelligence and Intelligent Systems" , Oxford University Press-2015

MOOCs:

1. https://www.coursera.org/lecture/ibm-exploratory-data-analysis-for-machine-learning/introduction-to-artificial-intelligence-and-machine-learning-DMVcd
2. https://nptel.ac.in/courses/106/105/106105077/

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE751.1	2	2	2	-	-	-	-	-	-	-	-	1	2	-	-	-
21ISE751.2	2	-	2	-	-	-	-	-	-	-	-	1	2	-	-	-
21ISE751.3	2	2	2	-	-	-	-	-	-	-	-	1	2	-	-	-
21ISE751.4	2	2	2	-	-	-	-	-	-	-	-	1	2	-	-	-
Average	2	2	2	-	-	-	-	-	-	-	-	1	2	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Introduction to Robotics

Course Code	21ISE752	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Knowledge on Hardware components of a system

Course Learning Objectives:

CLO1	Acquire the knowledge in various robot structures and their workspace.
CLO2	Enhance the skills in performing kinematics analysis of robot systems
CLO3	Provide the knowledge of the dynamics associated with the operation of robotic systems
CLO4	Provide the knowledge and analysis skills associated with trajectory planning.
CLO5	Understand material handling and robot applications in industries.

Content	No.of Hours/ RBT levels
Module 1 Introduction: Automation and robotic, Robotics in Science Fiction, Robotics history, market and Future prospects, Robot Anatomy, work volume, Robot Drive Systems, control systems and Dynamic Performance. **(Text Book 1- Chapter 1.1 to 1.4, 2.1 to 2.5)**	**08 Hours L2**
Module 2 Controls systems and Components: concepts and Models, controllers, robot activation and feedback components, position sensors, velocity sensors, actuators, Robot joint control design Motion analysis: Basic rotation matrices, composite rotation matrices, Euler angles, equivalent angle and axis, homogeneous transformation, problems; Manipulator kinematics: D-H notations, joint coordinates. **(Text Book 1- Chapter 3.1 to 3.9,4)**	**08 Hours L2**
Module 3 End Effectors: Types, Mechanical Grippers, other types of Grippers, Tools, The robot/end effector interface. Considerations in gripper selection and design Sensors in Robotics: Transducers and sensors, Tactile sensors, Proximity sensors and range sensors, uses of sensors in Robotics **(Text Book 1- Chapter 5,6)**	**08 Hours L2**
Module 4 Machine vision: Introduction, sensing and digitizing functions in machine vision, Image Processing and Analysis, Training and Vision system, Robotics Application. Robot Programming: Methods, Lead through Programming Methods, A robot Program as a path in Space, Motion Interpolation, commands, Branching and capabilities and limitations of Lead through methods. **(Text Book 1 -Chapter 7,8)**	**08 Hours L2**
Module 5 Robot Languages: Textual robot language, generation, structure, constants, variable and other data objects, motion commands, end effector and sensor commands, computations, and operations. program control and subroutines, communications, and data processing, monitor mode commands. **(Text Book -Chapter 9)**	**08 Hours L2**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE752.1	Understand Fundaments of robots and control systems
21ISE752.2	Understand components and motion analysis of the industrial robots.
21ISE752.3	Understand usage of different end effectors and grippers for industrial applications.
21ISE752.4	Identify the robot actuators and sensors used
21ISE752.5	Acquire the knowledge of machine vision and language used to program industrial robotics

Textbooks:

1. Groover M. P, "Industrial Robotics", Tata Mc Graw-Hill, 1 st Edition, 2013.

Reference books:

1. Richard D. Klafter, "Robotic Engineering", Prentice Hall, 1st Edition, 2013.
2. Fu K S, "Robotics", McGraw-Hill, 1st Edition, 2013.
3. J.J Criag, "Introduction to Robotic Mechanics and Control", Pearson, 3rd Edition, 2013.

MOOCs:

1. https://onlinecourses.nptel.ac.in/noc22_de11/preview
2. https://www.doc.ic.ac.uk/~ajd/Robotics/RoboticsResources/lecture1.pdf
3. https://opencourses.emu.edu.tr/course/view.php?id=32

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE752.1	3	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-
21ISE752.2	3	2	-	-	-	-	-	-	-	-	-	2	2	-	-	-
21ISE752.3	3	2	-	-	-	-	-	-	-	-	-	2	2	-	-	-
21ISE752.4	3	2	-	-	-	-	-	-	-	-	-	2	2	-	-	-
21ISE752.5	3	2	-	-	-	-	-	-	-	-	-	2	2	-	-	-
Average	3	2	-	-	-	-	-	-	-	-	-	2	2	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Introduction to Database Management Systems

Course Code	21ISE753	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3 Hours

Prerequisites: Basics of Database

Course Learning Objectives:

CLO1	Provide a strong foundation in database concepts, technology, and practice.
CLO2	Practice SQL programming through a variety of database problems.
CLO3	Demonstrate the use of concurrency and transactions in database
CLO4	Design and build database applications for real world problems.
CLO5	Provide a strong foundation in database concepts, technology, and practice.

Content	No.of Hours/ RBT levels
Module 1 **Introduction to Databases**: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications. **Overview of Database Languages and Architectures**: Data Models, Schemas and Instances. Three schema architecture and data independence, database languages. **Conceptual Data Modelling using Entities and Relationships**: Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, examples.	**08 Hours L2**
Module 2 **Relational Model**: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations. **Mapping Conceptual Design into a Logical Design:** Relational Database Design using ER-to-Relational mapping. **SQL:** SQL data definition and data types, specifying constraints in SQL, retrieval queries inSQL, INSERT, DELETE, and UPDATE statements in SQL	**08Hours L2**
Module 3 **SQL: Advances Queries**: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL. **Database Application Development:** Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces.	**08 Hours L2**
Module 4 **Normalization**: Database Design Theory –Informal design guidelines for relation schema, Normal Forms based on Primary Keys, Second and Third Normal Forms. **Transaction Processing:** Introduction to Transaction Processing, Transaction and System Concepts, Desirable properties of Transactions, Transaction support inSQL.	**08 Hours L2**

Module 5	
Concurrency Control in Databases: Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering. **Introduction to Database Recovery Protocols:** Recovery Concepts, NO-UNDO/REDO recovery based on Deferred update, Recovery techniques based on immediate update, Shadow paging, Database backup and recovery from catastrophic failures.	**08 Hours** **L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE753.1	Discuss the basic concepts, architecture and data models of DBMS.
21ISE753.2	Design the conceptual schema using ER diagram and relational modelling concepts.
21ISE753.3	Apply Structured Query Language, JDBC for developing the database applications.
21ISE753.4	Apply Normalization techniques in designing the Database.
21ISE753.5	Illustrate transaction processing, concurrency control and database recovery protocols in databases.

Textbooks:

1. Fundamentals of Database Systems, RamezElmasri and Shamkant B. Navathe, 7th Edition, 2017,Pearson.

Reference books:

1. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill
2. Database System Concepts, SilberschatzKorth and Sudharshan, 6th Edition, Mc-GrawHill, 2013.
3. Database Principles Fundamentals of Design, Implementation and Management, Coronel, Morris, and Rob,
Cengage Learning 2012.

MOOCs

1. http://nptel.ac.in
2. https://www.khanacademy.org/
3. https://www.class-central.com(MOOCS)
4. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test- 3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE753.1	2	-	-	-	-	-	-	-	-	-	-	2	3	-	-	1
21ISE753.2	3	3	3	-	-	-	-	-	2	3	-	2	3	-	-	1
21ISE753.3	3	3	3	-	3	-	-	-	3	3	-	2	3	-	-	1
21ISE753.4	3	3	3	-	-	-	-	-	3	3	-	2	3	-	-	1
21ISE753.5	3	3	3	-	3	-	-	-	3	2	-	2	3	-	-	1
Average	2.8	3	3	-	3	-	-	-	2.75	2.75	-	2	3	-	-	1

Low-1: Medium-2: High-3

SEMESTER – VII

Course: Introduction to Web Designing

Course Code	21ISE754	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Prerequisites: Basic Programming Languages like C, Java

Course Learning Objectives:

CLO1	Illustrate the Semantic Structure of HTML and CSS
CLO2	Compose forms and tables using HTML and CSS
CLO3	Design Client-Side programs using JavaScript and Server-Side programs using PHP
CLO4	Infer Object Oriented Programming capabilities of PHP
CLO5	Examine JavaScript frameworks such as jQuery and Backbone

Content	No.of Hours/ RBT levels
Module 1 Introduction to HTML, what is HTML and Where did it come from? HTML Syntax, Semantic Markup, Structure of HTML Documents. Introduction to CSS, what is CSS? CSS Syntax, Location of Styles, Selectors, The Box Model.	**08 Hours L3**
Module 2 HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Microformats. Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts.	**08 Hours L3**
Module 3 JavaScript: Client-Side Scripting, what is JavaScript and What can it do? JavaScript Design Principles, where does JavaScript Go? Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms	**08 Hours L3**
Module 4 PHP: Introduction to Server-Side Development with PHP, what is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions. PHP Arrays and Super global Arrays, $_GET and $_POST Super global Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files.	**08 Hours L3**
Module 5 PHP: Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, what are Errors and Exceptions? PHP Error Reporting, PHP Error, and Exception Handling.	**08 Hours L3**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE754.1	Develop web pages using HTML tags and CSS.
21ISE754.2	Construct tables, forms, and multi-column layouts using HTML and advanced CSS.
21ISE754.3	Apply JavaScript and PHP concepts in developing client side and server-side scripts.
21ISE754.4	Illustrate the usage of advanced PHP concepts in developing complex server-side programs.
21ISE754.5	Discuss web services, applications, and JavaScript frameworks like jQuery to focus on core features

Textbooks:

1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 1st Edition, Pearson Education India. (ISBN:978-9332575271)

Reference books:

1. Robin Nixon, "Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5", 4thEdition, O"Reilly Publications, 2015. (ISBN:978-9352130153)
2. Luke Welling, Laura Thomson, "PHP and MySQL Web Development", 5th Edition, Pearson Education, 2016. (ISBN:978-9332582736)
3. Nicholas C Zakas, "Professional JavaScript for Web Developers", 3rd Edition, Wrox/Wiley India, 2012. (ISBN:978-8126535088)
4. David Sawyer Mcfarland, "JavaScript & jQuery: The Missing Manual", 1st Edition, "Reilly/Shroff Publishers & Distributors Pvt Ltd, 2014

MOOCs:

1. https://www.udemy.com/topic/cisco/
2. https://www.udemy.com/topic/cisco-ccna/
3. https://www.udemy.com/topic/cisco-sd-wan/

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE754.1	2	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
21ISE754.2	2	2	2	-	-	-	-	-	-	-	-	2	2	-	-	-
21ISE754.3	2	2	2	-	-	-	-	-	-	-	-	2	-	-	-	-
21ISE754.4	2	2	2	-	-	-	-	-	-	-	-	2	2	-	-	-
21ISE754.5	2	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-
Average	2	2	2	-	-	-	-	-	-	-	-	2	2	-	-	-

Low-1: Medium-2: High-3

8th Semester Syllabus

SEMESTER – VIII

Course: Blockchain Technology

Course Code	21ISE811	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Basics of networking and Cryptography

Course Learning Objectives:

CLO1	Understand the basic terminologies of cryptography.
CLO2	Understand how blockchain systems (mainly Bitcoin and Ethereum) work.
CLO3	Explain smart contracts and distributed applications.
CLO4	Understand various applications of Blockchain.

Content	No.of Hours/ RBT levels
Module 1 Blockchain 101: Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain.	**08 Hours L2**
Module 2 Decentralization and Cryptography: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations. Cryptography and Technical Foundations: Cryptographic primitives, Asymmetric cryptography, Public and private keys.	**08 Hours L2**
Module 3 Bitcoin and Alternative Coins A: Bitcoin, Transactions, Blockchain, Bitcoin payments B: Alternative Coins, Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash.	**08 Hours L2**
Module 4 Smart Contracts and Ethereum 101: Smart Contracts: Definition, Ricardian contracts. Ethereum 101:Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts.	**08 Hours L3**
Module 5 Alternative Blockchains: Blockchains Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media.	**08 Hours L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE811.1	Summarize the terminologies and types of block chain.
21ISE811.2	Understand the basics of distributed system and cryptographic terminologies.
21ISE811.3	Outline distributed consensus in Bitcoin and its alternative options.
21ISE811.4	Develop Smart contracts which can be applied for various use cases.
21ISE811.5	Illustrate various applications of Blockchain.

Textbooks:

1. Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1- 78712-544-5, 2017

Reference books:

1. Bitcoin and Cryptocurrency Technologies, Author- Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Princeton University, 2016 Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
2. DR. Gavin Wood, ``ETHEREUM: A Secure Decentralized Transaction Ledger,''Yellow paper.2014.

E-Books / Web References :

1. Blockchain for dummies-IBM limited edition http://gunkelweb.com/coms465/texts/ibm_blockchain.pdf.
2. https://www.blockchainexpert.uk/book/blockchain-book.pdf

MOOCs:

1. https://www.upgrad.com/blog/blockchain-free-online-course/

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test- 3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE811.1	3	2	1	-	-	-	-	-	-	-	-	-	-	3	-	-
21ISE811.2	3	2	1	-	-	-	-	2	-	-	-	-	-	3	-	-
21ISE811.3	3	2	1	-	-	-	-	3	-	-	-	-	-	3	-	-
21ISE811.4	3	3	1	2	-	-	-	3	-	-	-	-	-	3	-	-
21ISE811.5	3	-	1	-	-	-	-	3	-	-	-	-	-	3	-	-
Average	3	3	1	2	-	-	-	3	-	-	-	-	-	3	-	-

Low-1: Medium-2: High-3

SEMESTER – VIII

Course: System Modeling and Simulation

Course Code	21ISE812	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3

Prerequisites: Probability, Basics of Mathematics

Course Learning Objectives:

CLO1	Define the basics of simulation modelling and replicating the practical situations in organizations
CLO2	Develop simulation model using heuristic methods.
CLO3	Generate random numbers and random variates using different techniques.
CLO4	Analysis of Simulation models using input /output analysers
CLO5	Explain Verification and Validation of simulation model.

Content	No. of Hours/ RBT levels
Module 1 **Introduction**: When simulation is the appropriate tool and when it is not appropriate, Advantages and disadvantages of Simulation; Areas of application, Systems and system environment; Components of a system; Discrete and continuous systems, Model of a system; Types of Models. **Discrete-Event System Simulation examples:** Simulation of queuing systems. General Principles, Simulation Software: Concepts in Discrete-Event Simulation. The Event-Scheduling / Time-Advance Algorithm, Manual simulation Using Event Scheduling	**08 Hours L3**
Module 2 **Statistical Models in Simulation:** Review of terminology and concepts, Useful statistical models, Discrete distributions. Continuous distributions, Poisson process, Empirical distributions.	**08 Hours L3**
Module 3 **Random-Number Generation:** Properties of random numbers; Generation of pseudo-random numbers, Techniques for generating random numbers, Tests for Random Numbers, Random-Variate Generation: Inverse transform technique Acceptance-Rejection technique	**08 Hours L3**
Module 4 **Input Modeling:** Data Collection; Identifying the distribution with data, Parameter estimation, Goodness of Fit Tests, fitting a non-stationary Poisson process, Selecting input models without data, Multivariate and Time-Series input models.	**08 Hours L3**
Module 5 **Estimation of Absolute Performance Output Analysis for A Single Model: Types** of simulations with Respect to Output analysis, Stochastic Nature of Output Data, Measures of Performance and their Estimation, Output Analysis for Terminating Simulations, Output analysis for Steady-State Simulations. Problems **Verification, Calibration And Validation**: Optimization: Model building, verification and validation, Verification of simulation models, Verification of simulation models, Calibration and validation of models, Optimization via Simulation.	**08 Hours L2**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE812.1	Describe the role of important elements of discrete event simulation and modelling paradigm.
21ISE812.2	Conceptualize real world situations related to systems development decisions, originating from source requirements and goals.
21ISE812.3	Interpret the model and its results to resolve critical issues in a real world environment.
21ISE812.4	Apply random number variates to develop simulation models
21ISE812.5	Analyze output data produced by a model and test validity of the model
21ISE812.6	Explain the concepts of verification and validation

Textbooks:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation 5th Edition, Pearson Education, 2010.

Reference books:

1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson Education, 2006.
2. Averill M. Law: Simulation Modeling and Analysis, 4th Edition, Tata McGraw-Hill, 2007

MOOCs:

http://nptel.ac.in/courses/112107214/2
https://cs.wmich.edu/alfuqaha/Spring10/cs6910/lectures/Chapter11.pdf

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE812.1	2	2	1	1	-	1	-	-	-	-	-	1	1	-	-	-
21ISE812.2	2	3	-	1	-	1	2	1	2	-	-	2	1	-	-	-
21ISE812.3	2	3	2	2	2	2	1	-	1	-	-	1	1	-	-	-
21ISE812.4	1	2	1	-	2	1	-	-	-	-	-	1	1	-	-	-
21ISE812.5	2	2	-	-	2	-	-	-	-	-	-	2	1	-	-	-
21ISE812.6	-	-	-	-	1	-	-	--	-	-	-	-	1	-	-	-
Average	**1.8**	**2.4**	**1.3**	**1.3**	**1.7**	**1.2**	**1.5**	**1**	**1.5**	**-**	**-**	**1.2**	**1**	**-**	**-**	**-**

Low-1: Medium-2: High-3

SEMESTER – VIII

Course: Software Architecture and Design Pattern

Course Code	21ISE813	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Prerequisites: Software Engineering

Course Learning Objectives:

CLO1	Understand the design pattern, its catalog and how design patterns solve design problems
CLO2	Understand the various phases in system analysis.
CLO3	Understand the various design patterns
CLO4	Understand the Interactive systems and the MVC architecture
CLO5	Understand the implementing an object-oriented system on the web

Content	No. of Hours/ RBT levels
Module 1 **Introduction**: what is a design pattern? describing design patterns, the catalog of design pattern, organizing the catalog, how design patterns solve design problems, how to select a design pattern, how to use a design pattern. What is object-oriented development? key concepts of object-oriented design other related concepts, benefits and drawbacks of the paradigm	**08 Hours L2**
Module 2 **Analysis a System:** overview of the analysis phase, stage 1: gathering the requirements functional requirements specification, defining conceptual classes and relationships, using the knowledge of the domain. Design and Implementation, discussions and further reading.	**08Hours L3**
Module 3 **Design Pattern Catalog:** Structural patterns, Adapter, bridge, composite, decorator, facade, flyweight, proxy.	**08 Hours L3**
Module 4 **Interactive systems and the MVC architecture:** Introduction, The MVC architectural pattern, analyzing a simple drawing program, designing the system, designing of the subsystems, getting into implementation, implementing undo operation, drawing incomplete items, adding a new feature, pattern-based solutions**.**	**08 Hours L3**
Module 5 **Designing with Distributed Objects:** Client server system, java remote method invocation, implementing an object-oriented system on the web (discussions and further reading) a note on input and output, selection statements, loops arrays.	**08 Hours L3**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE813.1	Discuss the design patterns and design principles to solve the software design problems.
21ISE813.2	Explain object-oriented modeling and design concepts
21ISE813.3	Identify the range of structural patterns in the design of object-oriented systems
21ISE813.4	Discuss the interactive systems and MVC architecture
21ISE813.5	Demonstrate the design of distributed objects

Textbooks:

1. Object-oriented analysis, design and implementation, brahma dathan, sarnath rammath, universities press,2013
2. Design patterns, erich gamma, Richard helan, Ralph johman, john vlissides, PEARSON Publication,2013.

Reference books:

1. 1. Frank Bachmann, Regine Meunier, Hans Rohnert "Pattern Oriented Software Architecture" Volume 1, 1996.
2. William J Brown et al., "Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis", John Wiley, 1998.

MOOCs:

https://www.coursera.org/specializations/software-design-architecture
https://www.my-mooc.com/en/mooc/software-architecture-design--ud821/

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module**.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE813.1	3	3	3	-	-	-	2	-	-	-	-	-	3	3	-	-
21ISE813.2	3	3	3	-	-	-	2	-	-	-	-	-	3	2	-	-
21ISE813.3	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
21ISE813.4	3	3	3	-	-	-	2	-	-	-	-	-	3	2	-	-
21ISE813.5	3	3	3	-	-	-	2	-	-	-	-	-	-	-	-	-
Average	3	3	3	-	-	-	2	-	-	-	-	-	3	2	-	-

Low-1: Medium-2: High-3

SEMESTER – VIII

Course: Green Computing

Course Code	21ISE814	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Course Learning Objectives:

CLO1	Learn about the basics of Green computing
CLO2	Learn about Green assets and modeling
CLO3	Explain Grid framework of green computing
CLO4	Learn Socio-cultural aspects of Green IT, Protocols, Standards, and Audits
CLO5	Learn Case Studies related to Green computing

Content	No. of Hours/ RBT levels
Module 1 **Fundamentals:** Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics. **Text Book-1: Chapter 1**	**08 Hours** **L2**
Module 2 **Green Assets and Modelling:** Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models. **Text Book-1: Chapter 2**	**08 Hours** **L2**
Module 3 **Grid Framework:** Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data centre – Green Grid framework. **Text Book-1: Chapter 3**	**08 Hours** **L2**
Module 4 **Green Compliance:** Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future. **Text Book-1: Chapter 4**	**08 Hours** **L2**
Module 5 **Case Studies:** The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector. **Text Book-1: Chapter 5**	**08 Hours** **L2**

COURSE OUTCOMES
Upon completion of this course, student will be able to:

21ISE814.1	Describe Green IT Fundamentals
21ISE814.2	Describe Green Assets, Green Enterprise Architecture, Green Information Systems
21ISE814.3	Explain Virtualization of IT systems, Green Data centre & Green Grid framework
21ISE814.4	Illustrate Socio-cultural aspects of Green IT, Protocols, Standards, and Audits
21ISE814.5	Demonstrate Case Studies related to Green computing

Textbooks:

1. Bhuvan Unhelkar, —**Green IT Strategies and Applications-Using Environmental Intelligence**, CRC Press, June 2014.
2. Woody Leonhard, Katherine Murray, —**Green Home computing for dummies**, August 2012

Reference books:

1. Alin Gales, Michael Schaefer, Mike Ebbers, —Green Data Centre: steps for the Journey, Shroff/IBM redbook, 2011.
2. John Lamb, —The Greening of IT, Pearson Education, 2009.
3. Jason Harris, —Green Computing and Green IT- Best Practices on regulations & industry, Lulu.com,2008
4. Carl speshocky, —Empowering Green Initiatives with IT, John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), —Green computing: Large Scale energy efficiency, CRC Press

MOOCs:

1. Green Computing from SketchUp to Grasshopper
https://www.acedge.in/courses/green-computing
2. How To Start Green Home Computing- Udemy
https://www.udemy.com/course/how-to-start-green-home-computing/

Scheme of Examination:

Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module**.**

Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE814.1	3	3	-	-	-	2	2	-	-	-	-	2	-	2	-	-
21ISE814.2	3	3	-	-	-	2	2	-	-	-	-	2	-	2	-	-
21ISE814.3	3	3	-	-	-	2	2	-	-	-	-	2	-	2	-	-
21ISE814.4	3	3	-	-	-	2	2	-	-	-	-	2	-	2	-	-
21ISE814.5	3	3	-	-	-	2	2	-	-	-	-	2	-	2	-	-
Average	**3**	**3**	**-**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**-**	**-**

Low-1: Medium-2: High-3

SEMESTER – VIII

Course: Bio Informatics

Course Code	21ISE821	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	3 hrs

Prerequisites: Programming Languages-C, Python

Course Learning Objectives:

CLO1	Basic knowledge of sources of sequences and protein structure data
CLO2	Understanding of the relevance and importance of bioinformatics data
CLO3	Exposure to basic algorithms used for processing bioinformatics data.

Content	No.of Hours/ RBT levels
Module 1 What is Bioinformatics and its relation with molecular biology. Introduction to Genes and Proteins: Genome Sequences ORFs, Genes, Introns, Exons, Splice Variants DNA/RNA Secondary Structure Triplet Coding Protein Sequences Protein Structure: Secondary, Tertiary, Quaternary, The notion of Homology, Need for informatics tools and exercises. Applications of Bioinformatics.	**08 Hours L2**
Module 2 Biological Database and its Types, Introduction to data types and Source. Population and sample, Classification and Presentation of Data. Quality of data, private and public data sources. General Introduction of Biological Databases; Nucleic acid databases (NCBI, DDBJ, and EMBL). Protein databases (Primary, Composite, and Secondary). Specialized Genome databases: (SGD, TIGR, and ACeDB). Structure databases (CATH, SCOP, and PDBsum)	**08 Hours L2**
Module 3 Data storage and retrieval and Interoperability, Flat files, relational, object-oriented databases and controlled vocabularies. File Format (Genbank, DDBJ, FASTA, PDB, SwissProt).	**08 Hours L2**
Module 4 Predictive Methods: Predictive Methods using Nucleotide sequences: Framework, masking repetitive DNA, Database searches, Codon Bias Detection, Detecting Functional Sites in the DNA, Integrated Gene Parsing, finding RNA Genes, Web based tools (GENSCAN, GRAIL, GENEFINDER). Predictive Methods using Protein sequences: Protein Identity based on composition, Related web-based software (JPRED, NNPREDICT).	**08 Hours L2**
Module 5 Molecular Modeling & Visualization: Concepts in Molecular Modelling-Coordinate Systems, concept of energy minimization, different types of interactions and formulation of force fields. Basic MD algorithm, its limitations, treatment of long-range forces. Comparative modelling, constructing an initial model, refining the model, manipulating the model; molecular superposition and structural alignment. Usages of visualization software available in public domain like VMD, Rasmol, Pymol, SpdbViewer, and Cn3D.	**08 Hours L2**

Course Outcomes:
Upon successful completion of this course, student will be able to

21ISE821.1	Understand the basics of bioinformatics and molecular biology
21ISE821.2	Understand different biological databases and its types
21ISE821.3	Understand Data storage and retrieval Interoperability
21ISE821.4	Analyze biological data using predictive and comparative methods
21ISE821.5	Apply Molecular Modeling & Visualization tools on data

Textbooks:

1. D. Baxevanis and F. Oulette, (2004) "Bioinformatics: A practical guide to the analysis of genes and proteins", Wiley Indian Edition
2. Cynthia Gibas and Per Jambeck (2001), "Developing Bioinformatics Computer Skills". O'Reilly press, Shorff Publishers and Distributors Pvt. Ltd., Mumbai.

Reference Books:

1. T. K. Attwood & D. J. Parry-Smith (2001), "Introduction to Bioinformatics", Pearson Education Ltd, Low-Price Edition
2. Computational methods for macromolecular sequence analysis: R F Doolittle. Acad. Press. 1996
3. Bioinformatics: Methods and Applications Parag Rastogi and S.C. Rastogi PHI Fourth Edition 2004

E-Books / Web References :

1. http://www.ru.ac.bd/wp-content/uploads/sites/25/2019/03/410_04_Baxevanis_Bioinformatics_-a-practical-guide-to-the-analysis-of-genes-and-proteins-Wiley.pdf
2. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.464.9078&rep=rep1&type=pdf

MOOCs

1. Learn Bioinformatics from scratch https://www.udemy.com/course/learn-bioinformatics/
2. Bioinformatics; Learn Docking & Mol Dynamics Simulation https://www.udemy.com course/bioinformatics_advance/
3. Biology Meets Programming: Bioinformatics for Beginners https://www.coursera.org/ learn/bioinformatics
4. Python for Genomic Data Science https://www.coursera.org/learn/python-genomics

Scheme of Examination:
Semester End Examination (SEE):
SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.
Continuous Internal Evaluation (CIE):
Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.
Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.

Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE821.1	3	3	2	-	-	-	-	-	-	-	-	1	-	-	-	-
21ISE821.2	3	3	2	1	2	-	-	-	-	-	-	1	-	-	-	-
21ISE821.3	3	3	2	-	2	-	-	-	-	-	-	1	-	-	-	-
21ISE821.4	3	3	2	1	2	-	-	-	-	-	-	1	-	-	-	-
21ISE821.5	3	3	2	1	2	-	-	-	-	-	-	1	-	-	-	-
Average	3	3	2	1	2	-	-	-	-	-	-	1	-	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VIII

Course: Advanced Computer Architecture

Course Code	21ISE822	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	3	Examination Hours	03

Prerequisites: Algorithms

Course Learning Objectives:

CLO1	To understand the basic concepts of computer architecture.
CLO2	To understand the need for pipelining and parallelism at instruction level.
CLO3	To expose the students, the problems related to memory, virtualization of memory.

Content	No.of Hours/ RBT levels
Module 1 **Fundamentals of Computer Design:** Introduction; Classes of computers; Defining computer architecture; Dependability; Measuring, reporting and summarizing Performance; Quantitative Principles of computer design. **PIPELINING:** Introduction; Pipeline hazards	**08 Hours L2**
Module 2 Implementation of pipeline; What makes pipelining hard to implement? **Instruction-Level Parallelism-1:** ILP: Concepts and challenges; Basic Compiler Techniques for exposing ILP; Reducing Branch costs with prediction	**08 Hours L2**
Module 3 Overcoming Data hazards with Dynamic scheduling; Hardware-based speculation. **Instruction-Level Parallelism-2:** Exploiting ILP using multiple issue and static scheduling; Exploiting ILP using dynamic scheduling, multiple issue and speculation	**08 Hours L2**
Module 4 **Multiprocessors and Thread-Level Parallelism:** Introduction; Symmetric shared-memory architectures; Performance of symmetric shared–memory multiprocessors; Distributed shared memory and directory-based coherence; Basics of synchronization; Models of Memory Consistency.	**08 Hours L2**
Module 5 **Review of Memory Hierarchy:** Introduction; Cache performance; Cache Optimizations, Virtual memory. **Memory Hierarchy Design:** Introduction; Advanced optimizations of Cache performance	**08 Hours L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE822.1	Explain the fundamentals of computer architecture.
21ISE822.2	Illustrate the usage of pipeline and parallelism at instruction level.
21ISE822.3	Interpret the issues related to multiprocessing
21ISE822.4	Explain the cache performance and cache optimizations

Text books:

1. **Computer Architecture, A Quantitative Approach** – John L. Hennessey and David A. Patterson: 4th Edition, Elsevier, 2007.

Reference books:

1. **Advanced Computer Architecture Parallelism, Scalability** – Kai Hwang: Programability, Tata Mc Grawhill, 2003.
2. **Parallel Computer Architecture, A Hardware / Software Approach** – David E. Culler, Jaswinder Pal Singh, Anoop Gupta:, Morgan Kaufman, 1999

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any **five full questions** choosing at least **one full question from each module.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE822.1	2	2	2	-	-	-	-	-	-	-	-	1	-	2	-	-
21ISE822.2	2	2	2	-	-	-	-	-	-	-	-	1	-	2	-	-
21ISE822.3	2	2	2	-	-	-	-	-	-	-	-	1	-	2	-	-
21ISE822.4	2	2	2	-	-	-	-	-	-	-	-	1	-	2	-	-
Average	2	2	2	-	-	-	-	-	-	-	-	1	-	2	-	-

Low-1: Medium-2: High-3

SEMESTER – VIII

Course: IT Law and Ethics

Course Code	21ISE823	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Course Learning Objectives:

CLO1	Understand the Cyber Law, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space
CLO2	Understand the Information Technology Act, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.
CLO3	Understand the Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes
CLO4	Understand the Electronic Business and Legal Issues
CLO5	Understand the Importance of Cyber Law, Significance of cyber-Ethics

Content	No. of Hours/ RBT levels
Module 1 **Introduction to Cyber Law:** Evolution of computer technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.	**8 Hours** **L2**
Module 2 **Information Technology Act:** Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.	**8 Hours** **L2**
Module 3 **Cyber Law and Related Legislation:** Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).	**8 Hours** **L2**

Module 4 **Electronic Business and Legal Issues:** Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.	**10 Hours** **L2**
Module 5 **Cyber Ethics:** The Importance of Cyber Law, Significance of cyber-Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.	**6 Hours** **L2**

COURSE OUTCOMES:

Upon completion of this course, student will be able to:

21ISE823.1	Understand Cyber laws, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space
21ISE823.2	Describe Information Technology act and Related Legislation & Cyber Law and Related Legislation
21ISE823.3	Demonstrate Electronic business and legal issues.
21ISE823.4	Interpret Cyber Ethics, Significance of cyber-Ethics, Need for Cyber regulations and Ethics. Ethics in Information society

Textbooks:

1. Cyber Security and Cyber Laws, Nilakshi Jain, Ramesh Menon, Wiley
2. Cyber Laws and IT protection, Harish Chander PHI publications

Reference books:

1. Cyber Laws and Ethics, ISBN: 9789390450244, Edition: 1st, 2021, Technical Publications
2. Cyber Law and Ethics Regulation of the Connected World By Mark Grabowski, Eric P. Robinson

MOOCs

1. https://www.khanacademy.org/
2. E-learning: www.vtu.ac.in

Scheme of Examination:

Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module.

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
21ISE823.1	-	-	-	-	-	-	-	**3**	-	**1**	**2**	**2**	-	-	-	-
21ISE823.2	-	-	-	-	-	-	-	3	-	1	2	2	-	-	-	-
21ISE823.3	-	-	-	-	-	-	-	3	-	1	2	2	-	-	-	-
21ISE823.4	-	-	-	-	-	-	-	3	-	1	2	2	-	-	-	-
Average	-	-	-	-	-	-	-	3	-	1	2	2	-	-	-	-

Low-1: Medium-2: High-3

SEMESTER – VIII

Course: Social Network Analysis

Course Code	21ISE824	CIE Marks	50
Hours/Week (L: T: P)	3:0:0	SEE Marks	50
No. of Credits	03	Examination Hours	03

Prerequisites: Computer Networks, Python Programming

Course Learning Objectives:

CLO1	Understand Social Network Analysis and Different Graph File Formats
CLO2	Explore how Python is used for Social Network Analysis
CLO3	Gather Real-World Network Data Sets and Cascading Behavior in Networks
CLO4	Explore Social Network Structure and Data Analysis in Healthcare

Content	No. of Hours/ RBT levels
Module 1 **Overview of Social Network Analysis and Different Graph File Formats:** Introduction—Social Network Analysis, Important Tools for the Collection and Analysis of Online Network Data, more on the Python Libraries and Associated Packages, Execution of SNA in Terms of Real-Time Application: Implementation in Python, Clarity Toward the Indices Employed in the Social Network Analysis, Centrality, Transitivity and Reciprocity, Balance and Status, Conclusion. **Text Book-1: Chapter 1**	**08 Hours L2**
Module 2 **Introduction to Python for Social Network Analysis:** Introduction, SNA and Graph Representation, The Common Representation of Graphs, Important Terms to Remember in Graph Representation, Tools to Analyze Network, MS Excel, UCINET, Importance of Analysis, Scope of Python in SNA, Comparison of Python with Traditional Tools, Installation, Good Practices, Use Case, Facebook Case Study, Real-Time Product from SNA, Nevaal Maps **Text Book-1: Chapter 2**	**08 Hours L3**
Module 3 **Handling Real-World Network Data Sets:** Introduction, Aspects of the Network, Graph, Node, Edges, and Neighbors, Small-World Phenomenon, Scale-Free Network, Network Data Sets, Conclusion. **Text Book-1: Chapter 3**	**08 Hours L2**
Module 4 **Cascading Behavior in Networks:** Introduction, Types of Data Generated in OSNs, Unstructured Data, Tools for Structuring the Data, User Behavior, Profiling, Pattern of User Behavior, Geo-Tagging, Cascaded Behavior, Cross Network Behavior, Pattern Analysis, Models for Cascading Pattern**. Text Book-1: Chapter 4**	**08 Hours L2**

Module 5	
Social Network Structure and Data Analysis in Healthcare: Introduction, Prognostic Analytics—Healthcare, Role of Social Media for Healthcare Applications, Social Media in Advanced Healthcare Support, Social Media Analytics, Phases Involved in Social Media Analytics, Metrics of Social Media Analytics, Evolution of NIHR, Conventional Strategies in Data Mining Techniques, Graph Theoretic, Opinion Evaluation in Social Network, Sentimental Analysis, Research Gaps in the Current Scenario, Conclusion and Challenges **Text Book-1: Chapter 5**	**08 Hours** **L2**

COURSE OUTCOMES:
Upon completion of this course, student will be able to:

21ISE824.1	Explain basic concepts Social Network Analysis and Different Graph File Formats
21ISE824.2	Make use of Python for Social Network Analysis
21ISE824.3	Make use of Real-World Network Data Sets to perform Social Network Analysis
21ISE824.4	Outline various cascading behavior in Networks
21ISE824.5	Explain Social Network Structure and Data Analysis in Healthcare

Textbooks:

1. **"Social Network Analysis: Theory and Applications"** Mohammad Gouse Galety (Editor), Chiai Al Atroshi (Editor), Buni Balabantaray (Editor), Sachi Nandan Mohanty (Editor) , Wiley Publication, ISBN: 978-1-119-83623-0 May 2022

Reference books:

1. **"Social Network Analysis (SNA)",** Tanmoy Chakraborty, Assistant Professor, IIIT Delhi, Wiley Publication

MOOCs:

1. Social Network Analysis - Udemy
   https://www.coursera.org/learn/social-network-analysis

2. Social Network Analysis - NPTEL
   https://onlinecourses.nptel.ac.in/noc22_cs117/preview

Scheme of Examination
Semester End Examination (SEE):

SEE Question paper is to be set for 100 marks and the marks scored will be proportionately reduced to 50. There will be two full questions (with a maximum of four sub questions) from each module carrying 20 marks each. Students are required to answer any five full questions choosing at least one full question from each module**.**

Continuous Internal Evaluation (CIE):

Three Tests are to be conducted for 40 marks each. Average Marks scored is added to test component.
CIE is executed by way of two quizzes / Alternate Assessment Tools (AATs), and two tests.
Two quizzes are to be conducted and each quiz is evaluated for 5 marks adding up to 10 marks.
All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively.

Some possible AATs: seminar/ assignments/term paper/ open ended experiments/ mini-projects/ concept videos/ partial reproduction of research work/ oral presentation of research work/ group activity/ developing a generic toolbox for problem solving/ report based on participation in create-a-thon/ make-a-thon/ code-a-thon/ hack-a-thon conducted by reputed organizations/ any other.
Typical Evaluation pattern for regular courses is shown in Table 2.

Table 2: Distribution of weightage for CIE & SEE of Regular courses

	Component	Marks	Total Marks
CIE	CIE Test-1	**40**	**50**
	CIE Test-2	**40**	
	CIE Test-3	**40**	
	Quiz 1/AAT	**05**	
	Quiz 2/AAT	**05**	
SEE	Semester End Examination	**50**	**50**
Grand Total			**100**

CO/PO Mapping																
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
21ISE824.1	3	3	-	-	-	-	-	-	-	-	-	2	-	-	2	-
21ISE824.2	3	3	2	-	-	-	-	-	-	-	-	2	-	-	2	-
21ISE824.3	3	3	2	-	-	-	-	-	-	-	-	2	-	-	2	-
21ISE824.4	3	3	-	-	-	-	-	-	-	-	-	2	-	-	2	-
21ISE824.5	3	3	-	-	-	-	-	-	-	-	-	2	-	-	2	-
Average	**3**	**3**	**2**	-	-	-	-	-	-	-	-	**2**	-	-	**2**	-

Low-1: Medium-2: High-3