



Nagarjuna College of Engineering & Technology, Bengaluru

An Autonomous Institute, Affiliated to VTU Belagavi

Scheme & Syllabus of III Semester ISE

**As per the NEP 2020 Guidelines,
Choice-Based Credit System
&
Outcome-Based Education**

Information Science & Engineering

w.e.f.

Academic Year 2023-2024

VISION

To disseminate the IT knowledge among the students for achieving excellence in education and to irradiate budding engineers as leaders in information technology.

MISSION

M1: To maintain leadership and excellence in Information Technology.

M2: Achieving excellence in IT through analysis, design, development of software products

M3: Developing communication skills, leadership qualities and team work among students' community by providing opportunities to work on various projects through internship with industry partners

M4: To inculcate Ethics and Human values for solving societal problems and environmental protection.

M5: Promoting research, higher studies and entrepreneurship among the students through outside world interaction

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates of Information Science and Engineering are expected to fulfil the following PEOs after a few years of their graduation.

PEO1: Pursue a successful career in the field of Information Science & Engineering or a related field utilizing his/her education and contribute to the profession as an excellent employee, or as an entrepreneur.

PEO2: Be able to work effectively in multidisciplinary environments and be responsible members/leaders of their communities

PEO3: The graduates of Information Science and Engineering Program should be able to establish an understanding of professionalism, teamwork, ethics, public policy that allows them to become good professional Engineers

PEO4: The graduates of Information Science and Engineering Program should be able to provide novel engineering solutions and efficient software designs with legal and ethical responsibility.

PEO5: Continuously improve by pursuing advanced degrees in engineering, business, or other professional fields through formal means or through informal self-study.

PROGRAM OUTCOMES (POs)

Graduates of the Information Science and Engineering Programme will be able to achieve the following POs:

PO1: Engineering Knowledge

Apply the knowledge of mathematics, science, engineering fundamentals, and Information Science and Engineering principles to the solution of complex problems in Information Science and Engineering.

PO2: Problem Analysis

Identify, formulate, research literature, and analyze complex Information Science and Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO3: Design/Development of Solutions

Design solutions for complex Information Science and Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of Complex problems

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions related to Information Science and Engineering problems.

PO5: Modern Tool Usage

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex Information Science and Engineering activities with an understanding of the limitations.

PO6: The Engineer and Society

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Information Science and Engineering practice.

PO7: Environment and Sustainability

Understand the impact of the professional **Information Science and Engineering** solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics

Apply ethical principles and commit to professional ethics and responsibilities and norms of the Information Science and Engineering practice.

PO9: Individual and Team work

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication

Communicate effectively on complex Information Science and Engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage Information Science and Engineering projects and in multidisciplinary environments.

PO12: Life Long Learning

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Program Specific Outcomes (PSOs) are what the graduates of a specific undergraduate engineering program should be able to do at the time of graduation.

PSO1: Professional Skills

The ability to understand, analyze and develop algorithms and write Information application programs in the areas related to information technology

PSO2: Problem-Solving Skills

Ability to understand the ethics, human values for solving societal problems and environmental protection

PSO3: Foundation of mathematical concepts

Ability to understand the software development skills and practical knowledge for promoting research, higher studies and entrepreneurship.

NAGARJUNA COLLEGE OF ENGINEERING & TECHNOLOGY, BENGALURU

B.E. in Information Science & Engineering

Scheme of Teaching and Examination 2023-24

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

(Effective from the academic year 2022-23)

III SEMESTER

Sl. No.	Course and Course Code		Course Title	Teaching Department	Teaching Hours / Week				Duration in Hours	Examination			Credits
					Theory / Lecture	Tutorial	Practical / Drawing	Self-study Component		CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PCC/BSC	22MATS31	Mathematics for Computer Science	Maths Dept.	3	0	0	-	03	50	50	100	3
2	IPCC	22ISI32	Data Structures and Applications	CSEB	3	0	2	-	03	50	50	100	4
3	IPCC	22ISI33	Object Oriented Programming using Java	CSEB	3	0	2	-	03	50	50	100	4
4	PCC	22IST34	Logic Design and Computer Organization	CSEB	3	0	0	-	03	50	50	100	3
5	PCCL	22ISL35	Python Based Mini project	CSEB	0	0	2	-	03	50	50	100	1
6	ESC	22IST36X	ESC/ETC/PLC	CSEB	3	0	0	-	03	50	50	100	3
7	UHV	22UHV37	Social Connect and Responsibility	Any Dept.	0	0	2	-	01	100	---	100	1
8	AEC/SEC	22ISL38X	Ability Enhancement Course/Skill Enhancement Course - III	CSEB	0	0	2	-	02	50	50	100	1
9	MC	22NSK39	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	0
		22PEK39	Physical Education (PE) (Sports and Athletics)	PE Director									
		22YOK39	Yoga	Yoga Teacher									
TOTAL					15	0	12	-	21	550	350	900	20
Engineering Science Course (ESC/ETC/PLC)													
22IST36A	IT Infrastructure and Management			22IST36C	Supply Chain Management								
22IST36B	Business Process Fundamentals			22IST36D	Human Computer Interaction								
Ability Enhancement Course – III (All are Laboratory Courses 0-0-2-0)													
22ISL38A	Unified Modelling Language Tools-Star UML			22ISL38C	Introduction to Office Tools								
22ISL38B	Introduction to MATLAB / SCILAB			22ISL38D	Introduction to Linux/Unix Shell Programming								

PCC:	Professional Core Course	PCCL:	Professional Core Course laboratory
UHV:	Universal Human Value Course	MC:	Mandatory Course (Non-Credit)
AEC:	Ability Enhancement Course	SEC:	Skill Enhancement Course
L:	Lecture	T:	Tutorial
P:	Practical	S/SDA	Skill Development Activity
CIE:	Continuous Internal Evaluation	SEE:	Semester End Evaluation
K :	Common to all the stream of engineering	ESC:	Engineering Science Course
ETC:	Emerging Technology Course	PLC:	Programming Language Course

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P : S) can be considered as (3 : 0 : 2 : 0) or (2 : 2 : 2 : 0). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23 may please be referred.

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Mathematics for Computer Science

Course Code	22MATS31	CIE Marks	50
Course Type	Theory	SEE Marks	50
Teaching Hours/Week (L: T: P: S)	2:2:0:0	Total Marks	100
Total Hours of Pedagogy	40 hours	Exam Hours	03
		Credits	03

Course objectives:

The goal of the course **Mathematics for Computer Science** is to,

1. Introduce the concept of random variables, probability distributions, specific discrete and continuous distributions with practical application in Computer Science Engineering and social life situations.
2. Provide the principles of statistical inferences and the basics of hypothesis testing with emphasis on some commonly encountered hypotheses.
3. Determine whether an input has a statistically significant effect on the system's response through ANOVA testing.

Teaching-Learning Process (General Instructions)

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

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
 - As an introduction to new topics (pre-lecture activity).
 - As a revision of topics (post-lecture activity).
 - As additional examples (post-lecture activity).
 - As an additional material of challenging topics (pre-and post-lecture activity).
 - As a model solution of some exercises (post-lecture activity).

Module-1

Probability Distributions:

Review of basic probability theory. Random variables (discrete and continuous), probability mass and density functions. Mathematical expectation, mean and variance. Binomial, Poisson and normal distributions- problems (derivations for mean and standard deviation for Binomial and Poisson distributions only).

8 Hours.

[Text 1: 26.1, 26.2, 26.7, 26.8, 26.9, 26.10, 26.13, 26.14, 26.15, 26.16]

[RBT Levels: L1, L2 and L3]

Self-Study: Exponential distribution.

Applications: Used for Modeling and prediction, analyzing data, algorithm design, cryptography, error detection, machine learning, computer vision, computer graphics, random number generation and natural language processing.

Module-2	
<p>Joint probability distribution & Markov Chain: Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation, covariance and correlation. Markov Chain: Introduction to Stochastic Process, Probability Vectors, Stochastic matrices, Regular stochastic matrices, Markov chains, Higher transition probabilities, Stationary distribution of Regular Markov chains and absorbing states. [Text 3: 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 5.6, 5.7] [RBT Levels: L1, L2 and L3] Self-Study: Joint Probability distribution for two continuous random variables. Applications: Joint distribution for system design and maintenance decisions. Markov chain for algorithmic design and networking.</p>	
8 Hours	
Module-3	
<p>Statistical Inference 1: Introduction, sampling distribution, standard error, testing of hypothesis, levels of significance, test of significances, confidence limits, simple sampling of attributes, test of significance for large samples, comparison of large samples. Sampling variables, central limit theorem and confidence limit for unknown mean. Test of Significance for means of two large samples. [Text 1: 27.1, 27.2, 27.3, 27.4 27.5, 27.6, 27.7, 27.8, 27.9, 27.10, 27.11, 27.12] [RBT Levels: L1, L2 and L3] Self-Study: Applications: Decision making and problem solving, software testing and quality control</p>	
8 Hours	
Module-4	
<p>Statistical Inference 2: Sampling of variables-small samples, students 't' distribution, Chi-square distribution as a test of goodness of fit. F-Distribution. [Text 1: 27.13, 27.14, 27.15, 27.16, 27.17, 27.18, 27.19] [RBT Levels: L1, L2 and L3] Self-Study: Fisher's Z-Distribution. Applications: Algorithm performance evaluation, Software testing, Hardware testing, Quality assurance, Biometric systems, Network security, database management, Biomedical informatics, Information retrieval, signal processing and image processing.</p>	
8 Hours	
Module-5	
<p>Design of Experiments and ANOVA: Principles of experimentation in design, Analysis of completely randomized design, randomized block design. The ANOVA Technique, Basic Principle of ANOVA, One-way ANOVA, Two-way ANOVA, Latin-square Design, and Analysis of Co-Variance. [Text 1:] [RBT Levels: L1, L2 and L3] Self-Study: Applications: Algorithm Optimization, Network performance, Database management, User experience design and Hardware design.</p>	
8 Hours	
Teaching-Learning Process for all modules	Chalk and Talk/PowerPoint presentation/YouTube videos.

Course Outcomes (Course Skill Set):

After successfully completing the course, the students will be able to:

CO1: Understand the basic concepts of probability, random variables, probability distribution and apply suitable probability distribution models for the given scenario.

CO2: Learn the concept of joint distribution and make use of the notion of a discrete-time Markov chain and n-step transition probabilities to solve the engineering application problem

CO3: Use statistical methodology and tools in the sampling analysis.

CO4: Compute the confidence intervals for the mean of the population by using different tests.

CO5: Apply the ANOVA test related to engineering problems.

Evaluation Details:

Evaluation Type		Component	Max Marks	Marks Reduced to	Min. Marks	Evaluation Details
Theory Component	Internal Assessment Tests (IAT)	IAT-1	25	25	20	Average of two IATs, Scaled down to 25 marks
		IAT-2	25			
	Comprehensive Continuous Evaluations (CCE)	CCE-1	25	25		Any two Assessment methods as per 220B4.2 of regulations. Average of two CCEs, scaled down to 25 marks
		CCE-2	25			
Total CIE -Theory				50	20	
SEE			100	50	18	Conducted for 100 marks And scaled down to 50.
CIE + SEE				100	40	

Suggested Learning Resources:**Text Books:**

1. **B. S. Grewal:** "Higher Engineering Mathematics", Khanna publishers, 44th Ed.2021.
2. **Ronald E. Walpole, Raymond H Myers, Sharon L Myers & Keying Ye** "Probability & Statistics for Engineers & Scientists", Pearson Education, 9th edition, 2017.
3. **Seymour Lipschutz and Marc Lars Lipson:** "Probability", (Chapters: 5 and 8), McGraw Hill Education (India) Private Limited, Chennai, Special Indian Edition, 2010.

Reference Books:

1. **Erwin Kreyszig**, "Advanced Engineering Mathematics", John Wiley & Sons, 9th Edition, 2006.
2. **Peter Bruce, Andrew Bruce & Peter Gedeck** "Practical Statistics for DataScientists" O'Reilly Media, Inc., 2nd edition **2020**.
3. **G Haribaskaran** "Probability, Queuing Theory & Reliability Engineering", LaxmiPublication, Latest Edition, 2006.
4. **Irwin Miller & Marylees Miller**, John E. Freund's "Mathematical Statistics with Applications" Pearson. Dorling Kindersley Pvt. Ltd. India, 8th edition, 2014.
5. **S C Gupta and V K Kapoor**, "Fundamentals of Mathematical Statistics", S Chand andCompany, Latest edition.
6. **Robert V. Hogg, Joseph W. McKean & Allen T. Craig.** "Introduction to Mathematical Statistics", Pearson Education 7th edition, 2013.

7. **Jim Pitman**. Probability, Springer-Verlag, 1993.
8. **Sheldon M. Ross**, “Introduction to Probability Models” 11th edition. Elsevier, 2014.
9. **A. M. Yaglom and I. M. Yaglom**, “Probability and Information”. D. Reidel Publishing Company. Distributed by Hindustan Publishing Corporation (India) Delhi, 1983.
10. **P. G. Hoel, S. C. Port and C. J. Stone**, “Introduction to Probability Theory”, Universal Book Stall, (Reprint), 2003.
11. **S. Ross**, “A First Course in Probability”, Pearson Education India, 6th Ed., 2002.
12. **W. Feller**, “An Introduction to Probability Theory and its Applications”, Vol. 1, Wiley, 3rd Ed., 1968.
13. **N.P. Bali and Manish Goyal**, A Textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
14. **Veerarajan T**, Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

E-Resources:

- <http://ac.in/courses.php?disciplineID=111>
- [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
- <http://academicearth.org/>
- VTU e-Shikshana Program
- VTU EDUSAT Program

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars

CO- PO Mapping :

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	2	3	1	-	-	-	-	-	-	-	-	-
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped												

Data Structures and Applications			
Course Code	22ISI32	CIE Marks	50
Teaching Hours/Week (L: T: P: S) (3:0:2:0)	Credits (3:0:0:0)	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory 10 hours Laboratory	Total Marks	100
Credits	03	Exam Hours	03
<p>Course objectives:</p> <p>This course will enable students to:</p> <ul style="list-style-type: none"> • Understand the basics of pointers and dynamic memory allocation. • Learn concepts of structure and its application in programming. • Gain knowledge to choose the specific linked lists for implementing real world problems. • Grasp the use of stacks and queues in solving complex problems. • Acquire knowledge of non linear data structure like trees. 			
<p>Teaching-Learning Process (General Instructions)</p> <p>These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes. 2. Show Video/animation films to explain evolution of communication technologies. 3. Encourage collaborative (Group) Learning in the class 4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking. 5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it. 6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them. 7. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding. 			
Module-1			
<p>Introduction: Data Structures, Classifications (Primitive & Non Primitive), Abstract Data Types(ADT)-Array, Structures, Self-Referential Structures and Unions, Arrays Review. Pointers and Dynamic Memory Allocation Functions. Pointer as function arguments, Functions returning pointers.</p> <p>Textbook 1: Chapter 1: 1.2; Chapter 2: 2.1 - 2.6;</p> <p>Textbook 2: Chapter 1: 1.1 - 1.4; Chapter 4: 4.1 - 4.8;</p> <p style="text-align: right;">08 Hours</p>			
Module-2			
<p>Recursion: Introduction to Recursion, Examples of Recursion: Factorial, Fibonacci Sequence, Tower of Hanoi</p> <p>Stacks: Definition, ADT-Stack, Array Representation of Stacks along with Stack Operations, Stack</p>			

<p>Applications: Polish notation, Infix to Postfix conversion, Infix to Prefix conversion, Evaluation of postfix expression. Textbook 1: Chapter 3: 3.1 - 3.7; Textbook 2: Chapter 6: 6.1 - 6.3, 6.5-6.14;</p>		08 Hours
Module-3		
<p>Queues: Definition, ADT-Queue, Array Representation, Queue Operations, Circular Queues, Programming Examples. Linked Lists: Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion. Stacks and Queues implementation using Linked Lists. Programming Examples. Textbook 1: Chapter 4: 4.1– 4.3, 4.7 - 4.8; 1 – 5.9;</p>		08 Hours
Module-4		
<p>Doubly Linked Lists, Circular lists: Doubly Linked lists, Circular Singly and Doubly linked lists; Basic operations: Insert, Delete and Display with programming examples. Application: Adding Polynomials. Textbook 1: Chapter 4: 4.4 – 4.5; Chapter 8: 8.1 - 8.2; Textbook 2: Chapter 5: 5.10</p>		08 Hours
Module-5		
<p>Trees: Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, Postorder, Preorder; Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application: Evaluation of Expression. Textbook 1: Chapter 5: 5.1 – 5.3, 5.5, 5.7;</p>		08 Hours
Teaching-Learning Process for all modules	Chalk and Talk, PowerPoint presentation, flip teaching, YouTube videos	
LIST OF LABORATORY PROGRAMS		
1	<p>Design, develop and execute a program in C based on the following requirements: An EMPLOYEE structure is to contain the following members: Employee_Number (an integer), Employee_Name (a string of characters), Basic_Salary (an integer), All_Allowances (an integer), IT (an integer), Net_Salary (an integer). Write a function to read the data of an employee, to calculate Net_Salary and to print the values of all the structure members. (All_Allowances = 123% of Basic, Income Tax (IT) = 30% of the gross salary (gross salary = Basic_Salary + All_Allowance), Net_Salary = Basic_Salary + All_Allowances –IT). Display the above data for at least 5 employees.</p>	

2	Write a program to Store Roll number of N students. Perform Insert and delete Roll_No at a given valid position (POS) using pointers. Display the status of array elements at any given point of time. Support the program with functions for each operations.
3	Develop an array implementation on stack and perform Push and Pop operations. Check for overflow and underflow conditions. Demonstrate stack implementation to check palindrome. Display the status of the stack for all the operations performed. Support the program with appropriate functions for each of the above operations.
4	Write a Program in C: a. Evaluate the Suffix (Postfix) expression with single digit operands and operators.
5	Implement Circular QUEUE program in C for rainbow colors (VIBGOYR) and perform Insert and Delete operations. Check for overflow and underflow conditions. Display the status of the Circular QUEUE for all the operations performed. Use pointers and functions.
6	Implement a Menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: <i>USN, Name, Avg_Marks</i> a. Create N number of Students Data by inserting at end of the list. b. Insert and Delete at front of the list c. Delete at the end of list d. Display the status of SLL d. Demonstration stack and queue e. Exit
7	Design and Develop following operations on Doubly Linked List (DLL) of Employee Data with the fields: <i>SSN, Name, Dept etc.</i> a. Create a Node of N Employees Data by inserting in front. b. Insert a new node to the right of key value. c. Perform Insertion and Deletion at End of DLL d. Display the status of DLL and count the number of nodes e. Exit
8	Design and Develop a program in C for the following operations on Binary Search Tree (BST) of Integers. a. Create a BST of N Integers b. Traverse the BST using Inorder, Preorder and Post Order techniques c. Search a KEY element in BST and display the appropriate message

Course Outcomes

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

CO1: Explore pointers and heterogeneous datatypes

CO2: Implement linear data structures, stack and Queue in solving real time scenario

CO3: Demonstrate various operations of singly and doubly linked Lists

CO4: Analyze usage of circular lists for application oriented problems.

CO5: Apply the concept of non-linear data structures – trees

Assessment Details (both CIE and SEE)						
Evaluation Type	Component	Max. Marks	Marks Reduced To	Min Marks	Evaluation Details	
Internal Assessment Test (IAT)	IAT 1	25	25	20	Average of two IATs, Scaled down to 25 Marks	
	IAT 2	25				
Comprehensive Continuous Evaluation (CCE)	CCE-1	25	25		20	Minimum of two Assessment Methods as per 22OB4.2 of regulation. Average of CCEs, Scaled down to 25
	CCE-2	25				
Total CIE		-	50	20	Scaled down Marks of IAT and CCE to 25	
SEE		100	50	18	Conducted for 100 Marks and Scaled down to 50	
CIE + SEE		-	100	40		

Suggested Learning Resources:

Text Books:

1. Ellis Horowitz and Sartaj Sahani, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.
2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.

Reference Books:

1. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning, 2014.
2. Reema Thareja, 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. A M Tenenbaum, Data Structures using C, PHI, 1989
5. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.

E-Resources:

- 1) <https://www.cs.princeton.edu/>
- 2) <https://www.opendatastructures.org/ods-cpp>
- 3) <https://www.lib.mdp.ac.in/ebook/DSa>
- 4) <https://ww.cs-fundamentals.com/data-structures/introduction-to-datastructures.php>
- 5) <https://www.cprogramming.com/algorithms-and-data-structures.html>
- 6) <https://online-learning.harvard.edu/course/data-structures-and-algorithms>

CO-PO-PSO Mapping:

POS	PO	PSO	PSO	PSO											
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	-	3	2	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	3	2	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	3	2	-	1
CO4	3	3	3	2	3	-	-	-	-	-	2	3	2	3	2
CO5	3	3	3	3	3	-	-	-	-	-	2	3	3	3	2
Avg	3	3	2.8	2.3	3	-	-	-	-	-	2	3	2.2	3	1.6

Object Oriented Programming Using Java

Course Code	22ISI33	CIE Marks	50
Teaching Hours/Week(L: T:P:S)	(3:0:2:0)	SEE Marks	50
Total Hours of Pedagogy	40hours Theory+13Labslots	Total Marks	100
Credits	04	Exam Hours	03

Course objectives:

This course will enable students to:

1. Learn the basic concepts of object-oriented programming.
2. Understand the basics of JAVA Programming using classes and objects.
3. Gain the knowledge of Inheritance and Interfaces.
4. Expose to the concepts of Packages and Exceptions that occur while programming in JAVA.
5. Acquire the knowledge of multi-threaded programming and String handling in JAVA.

Module – I

Introduction: Object Oriented Concepts: Procedure–Oriented Programming, Object Oriented Programming, Comparison of Object-Oriented Language with C. Introduction to Java: Java Buzzwords, The Byte code, Java Development Kit (JDK), Data types, Variables and arrays, Operators, Control statements, Simple Java programs.(Chapter 1,2,3,4 and 5 of Text 1) **08 Hours**

Module – II

Classes: Classes fundamentals, Declaring objects, Reference variables, this keyword, garbage collection. **Methods:** Method Prototyping, Member functions and Data members, Constructors, Objects and methods, MethodOverloading, Objects and arrays, Access modifiers, Setters and getters, Nested classes. (Chapter 6 and 7 of Text 1) **08 Hours**

Module – III

Inheritance, Interfaces: Inheritance basics, using super, creating multi-level hierarchy, method overriding, using Abstract classes, using final, **Interfaces:** Defining an Interface, Implementing an Interface, Nested Interfaces, Applying an Interface, variables in Interface, Interfaces can be extended. (Chapter 8 and 9 of Text 1) **08 Hours**

Module - IV

Packages, Exceptions: Access Protection, Importing Packages. **Exceptions:** Exception handling fundamentals, Exception types, uncaught exceptions, using try and catch, using multiple catch clauses, nested try statements, throw, throws, finally, Java’s built-in exceptions. (Chapter 9 and 10 of Text 1) **08 Hours**

Module – V

Multi-Threaded Programming, String Handling: What are threads? How to make the classes threadable, Extending threads, Implementing runnable, Synchronization. **String Handling:** String Constructors, String Operations, Character Extraction, String Comparison (Chapter 11 and 15 of Text 1) **08 Hours**

Lab Programs

1. A. Develop a Java program for an advanced arithmetic calculator that takes two integer operands and an operator from the user. The program should be capable of performing addition, subtraction, multiplication, and division. Ensure that the program handles input validation, including checking for the validity of the operator and non-negative values for the operands. After each calculation, ask the user if they want to perform another operation and provide a history of previous calculations upon request.

B. Write a Java program to generate the first 'n' terms of the Fibonacci series and determine the following:

1. Calculate the sum of all even terms in the series.
2. Find the product of all odd terms in the series.
3. Check and display the largest prime number within the series.
4. Calculate the average of the entire series.

2. A. Develop a Java program showcasing method overloading with a base class "Phone" containing the dial() method, and two subclasses "CameraPhone" and "SmartPhone" that inherit from the base class and enhance its features. The program should demonstrate and print the results of these enhancements..

B. Develop a Java program illustrating constructor overloading for calculating the area of a rectangle and a circle using appropriate constructors.

3. A. Create a Java program with a vehicle hierarchy, including Vehicle, Car, SportsCar, and Truck classes. Implement methods for starting and stopping in the base class and specialized methods for accelerating, adding turbo boost, and loading cargo in the subclasses, with appropriate method overrides.

B. Create a Java program that models electronic devices (e.g., smartphones, laptops, and tablets) using a common interface for power management. The program should allow users to interact with the devices and control their power state.

4. A. Develop a Java program that emulates a library system. Create two packages, `library` and `patron`. In the `library` package, define a `Book` class with a private title field. In the `patron` package, implement a `Patron` class that can borrow books. Demonstrate the use of packages, access protection, and class imports. Ensure that the book title remains inaccessible from outside the `library` package due to the `private` access modifier. Create a scenario where a patron, Alice, borrows a book from the library.

B. Develop a Java lab program that handles exceptions for division by zero and invalid input. Use `try-catch` blocks to catch `ArithmeticException` for division by zero and `InputMismatchException` for non-integer input and provide user-friendly error messages.

5. A. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.

B. Design a Java lab program to demonstrate string handling, including creating strings using constructors and literals, concatenating strings, extracting characters at a specified index, and comparing strings for equality.

Course Outcomes:

CO1: Explain the basic concepts of object-oriented programming.

CO2: Analyse the working of JAVA Programming using classes and objects.

CO3: Implementation of Inheritance and Interfaces.

CO4: Expose to the concepts of Packages and Exceptions that occur while programming in JAVA.

CO5: Develop the multi-threaded programming and String handling in JAVA.

Assessment Details (both CIE and SEE)

Evaluation Type	Component	Max. Marks	Marks Reduced To	Min Marks	Evaluation Details
Internal Assessment Test (IAT)	IAT 1	25	25	20	Average of two IATs, Scaled down to 25 Marks
	IAT 2	25			
Comprehensive Continuous Evaluation (CCE)	CCE-1	25	25		Minimum of two Assessment Methods as per 22OB4.2 of regulation. Average of CCEs, Scaled down to 25
	CCE-2	25			
Total CIE		-	50	20	Scaled down Marks of IAT and CCE to 25
SEE		100	50	18	Conducted for 100 Marks and Scaled down to 50
CIE + SEE		-	100	40	

Text Books:

- Herbert Schildt, "Java The Complete Reference", 7th Edition, Tata McGraw Hill, 2013, ISBN13:978-0072263855, (Chapters 1-11).

Reference Books:

- E Balagurusamy, "Programming with Java-A primer", 2nd Edition, Tata McGraw Hill companies, 2009, ISBN-13:978-9351343202.

CO-PO-PSO Mapping:

POS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	3	3	-	3	-	-	-	3	2	-	3	-	-	-
CO2	3	3	3	-	3	-	-	-	3	2	-	3	2	-	-
CO3	3	3	3	2	3	-	-	-	3	2	-	3	2	-	-
CO4	3	3	3	2	3	-	-	-	3	2	2	3	2	2	2
CO5	3	3	3	2	3	-	-	-	3	3	2	3	2	2	2
Avg	3	3	3	2	3	-	-	-	3	2.2	2	3	2	2	2

Logic Design and Computer Organization

Course Code	22IST34	CIE Marks	50
Teaching Hours/Week(L: T:P:S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40 Hours	Total Marks	100
Credits	03	Exam Hours	03

Pre-Requisites:

Students must be aware of basic Logic gates like AND, OR and NOT. Students should have the knowledge of Digital logic and its design and computer concepts like what is keyboard, mouse, monitor, input, output, primary memory and secondary memory etc.

Course Objectives :

The Student will:

1. Make use of simplifying techniques in the design of combinational circuits.
2. Illustrate combinational and sequential digital circuits.
3. Understand the organization and architecture of computer systems, their structure and operation.
4. Illustrate the concept of machine instructions and programs.
5. Understand the arithmetic and logical operations.

Module I

Karnaugh maps: Introduction to Binary logic and digital logic gates. Minimum forms of switching functions, Two and Three variable Karnaugh maps, Four variable Karnaugh maps, Determination of minimum expressions using essential prime implicants,

Quine-McClusky Method: Determination of prime implicants, the prime implicant chart, Petrick's method, Simplification of incompletely specified functions, Simplification using map-entered variables

08 Hours

Module II

Combinational circuit: Review of Combinational circuit design, Hazards in combinational Logic. Multiplexers, Decoders and Programmable Logic Devices: Multiplexers, three state buffers, decoders and encoders, Programmable Logic devices, Programmable Logic Arrays, Programmable Array Logic.

Flip Flops: Introduction, Flip-Flops, D Flip-Flop, S-R Flip-Flop, J-K Flip-Flop, T Flip-Flop

08 Hours

Module III

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.

08 Hours

Module IV

Input/output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Direct Memory Access, Buses, Interface Circuits.

08 Hours

Module V

Computer Airthmetic

Arithmetic: Addition and Subtraction of signed numbers, Design of Fast Adders, Multiplication of positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division floating –point Numbers and Operations.

08 Hours

Course outcomes:

The Student will be able to:

CO1: Simplify digital circuits using Karnaugh Map, and Quine-McClusky Methods.

CO2: Design various synchronous and asynchronous circuits using flip flops.

CO3: Describe the structure of computer and its basic processing unit with instruction set.

CO4: Analyze the input/output devices communicating with computer system.

CO5: Apply algorithms to perform arithmetic and logical operations, solve problems using computer performance equations.

Assessment Details (both CIE and SEE)

Evaluation Type	Component	Max. Marks	Marks Reduced To	Min Marks	Evaluation Details
Internal Assessment Test (IAT)	IAT 1	25	25	20	Average of two IATs, Scaled down to 25 Marks
	IAT 2	25			
Comprehensive Continuous Evaluation (CCE)	CCE-1	25	25	20	Minimum of two Assessment Methods as per 22OB4.2 of regulation. Average of CCEs, Scaled down to 25
	CCE-2	25			
Total CIE		-	50	20	Scaled down Marks of IAT and CCE to 25
SEE		100	50	18	Conducted for 100 Marks and Scaled down to 50
CIE + SEE		-	100	40	

Text Books

1. **Charles H Roth and Larry L Kinney, Analog and Digital Electronics**, Cengage Learning, 2019, 5th Edition, ISBN:81-315-0043-8. (**Chapter 5:** 5.1,5.2,5.3,5.4 **Chapter 6:** 6.1,6.2,6.3,6.4,6.5 **Chapter 8:** 8.1,8.4 **Chapter 9:** 9.1,9.2,9.3,9.4,9.5,9.6 **Chapter 11:** 11.4,11.5,11.6,11.7)
2. Donald P Leach, Albert Paul Malvino & Goutam Saha, Digital Principles and Applications, 8th Edition, Tata McGraw Hill, 2015.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition, Tata McGraw Hill, ISBN:978-1-25-900527-5. (**Chapter 1:** 1.3,1.4,1.6 **Chapter 2:** 2.2,2.3,2.4,2.5 **Chapter 4:** 4.1,4.2,4.4,4.5,4.6 **Chapter 6:** 6.1,6.2,6.3,6.4,6.5,6.6,6.7)
4. M. Morris Mano, Computer System Architecture, PHI, 3rd Edition, ISBN-81-203-0855-7.

Reference Books:

1. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson
2. Anil K Maini, Varsha Agarwal, Electronic Devices and Circuits, Wiley, 2012.

E - Resources:

1. Analog Electronic Circuits: <https://nptel.ac.in/courses/108/102/108102112/>
2. Digital Electronic Circuits: <https://nptel.ac.in/courses/108/105/108105132/>
3. <https://nptel.ac.in/courses/106/103/106103068/>
4. <https://nptel.ac.in/content/storage2/courses/106103068/pdf/coa.pdf>

CO-PO-PSO Mapping

PO'S	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	2	-	-	-	-	-	-	2	2	3	3	2
CO2	3	2	3	1	-	-	-	-	-	-	2	2	3	3	2
CO3	3	2	1	2	-	-	-	-	-	-	1	1	3	2	1
CO4	3	2	1	2	-	-	-	-	-	-	1	1	3	2	2
CO5	3	2	2	1	-	-	-	-	-	-	1	1	2	2	3

Python Based Mini Project			
Course Code	22ISL35	CIE Marks	50
Teaching Hours/Week(L: T:P:S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	28 Hours	Total Marks	100
Credits	01	Exam Hours	03
Course Objectives: 1. Motive students to work on literature survey, to understand the domain of their interest preferable in advanced and emerging technologies. 2. Summarize the literature survey and finalize their project work under selected domain. 3. Develop team work & presentation skills, and prepare the report.			
Course Content: <ul style="list-style-type: none"> Survey and study of published literature on the assigned topic related to emerging technologies like machine learning, Cyber security, Data Science, Web technologies etc. Working out a preliminary Approach to the Problem relating to the assigned topic. Preparing a written report on the Study conducted for presentation to the Department. Final Seminar, as oral Presentation before a Departmental Committee. 			
Assessment Details (both CIE and SEE)			
Parameter			Marks
Formation of team, selection of domain and submission of Synopsis			12
Carry out literature survey			10
Design and development, Preparation of the report			18
Rubrics based evaluation of Presentation and Viva			10
CIE Total Marks			50
Final Exam will be conducted for 50 marks (SEE)			
Total			100
Course Outcomes CO1 Review the current state of Art and trends in their area of interest in current technologies and identify a suitable problem in their chosen subject domain with justification. CO2 Survey the available research literature/documents for the tools and techniques to be used. CO3 Examine the functional, non-functional, and performance requirements of their chosen problem definition. CO4 Design system architecture and different components and develop all the system components using appropriate tools and techniques. CO5 Work effectively in a team and use good project management practices and defend the project work as a team.			

CO-PO & PSO Mapping:

PO's CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	1	3	2	2	3	-	3	3	3	3	3	3	2
CO2	3	3	-	3	3	2	-	3	3	2	3	3	2	2	2
CO3	3	3	3	2	2	2	-	-	3	2	3	3	3	3	1
CO4	3	3	3	3	3	2	-	3	3	2	3	3	3	3	-
CO5	2	2	3	3	3	1	-	3	3	3	3	3	3	3	-
Avg.	2.8	2.8	2.5	2.8	2.6	1.8	3	1.8	3	2.4	3	3	2.8	2.8	1.67

IT Infrastructure and Management

Course Code	22IST36A	CIE Marks	50
Teaching Hours/Week(L: T:P:S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40 Hours	Total Marks	100
Credits	03	Exam Hours	03

Pre-Requisites: Computer hardware platforms, Operating system platforms, Software applications, Data management and storage, Networking and telecommunications platforms, Internet, Consulting and system integration services.

Course Objectives :

The Student will:

1. Understanding the role of IT infrastructure with its functions and services.(Understanding)
2. Recognize the research, reporting and presentation approach using the latest ICT tools.
3. Study the combination of the technical and management issues in contemporary infrastructure management.
4. Learn the concepts related with Deadlock to solve Problems.
5. Familiarize the Protection and Security Mechanism in Operating System.

Module I

Infrastructure management overview: Introduction, IS components, Services of IT infrastructure, welfare of IT, Roles and responsibilities, challenges.

Organizing for Infrastructure management: IT infrastructure design factors, model of IT management, Elucidation methods, Documentation.

08 Hours

Module II

Staffing for system management: Introduction, Determining Required Skill Sets and Skill Levels Assessing the Skill Levels of Current Onboard Staff.

Customer Service: Introduction, Key Elements of Good Customer Service: Key Customers, Identifying Key Services, Identifying Key Processes that Support Key Services, Key Suppliers, Integrating the Key Elements of Good Customer Service, Cardinal Sins that Undermine Good Customer Service.

08 Hours

Module III

Performance and Tuning: Introduction, Performance and Tuning Applied to the Five Major Resource Environments: Server Environment, Disk Storage Environment, Database Environment, Network Environment and Desktop Computer Environment.

Problem management: The role of service desk, segregating and integrating service desk, Developing a Problem Management Process, client issues with problem management.

08 Hours

Module IV

Storage Management: Storage Management Capacity, Storage Management Performance, Storage Management Reliability, Storage Management Recoverability.

Network Management: Key Decisions about Network Management, business IT networks and components, digital transmission, IS vulnerabilities and threats.

08 Hours

Module V

Strategic Security: Introduction, Developing a Strategic Security Process, IT Strategic planning process, Tools & methodologies of IT strategic planning, Business system planning approach.

Facilities management: Introduction, Major Elements of Facilities Management, Tips to improve facilities management process.

08 Hours

Course outcomes:

The Student will be able to:

- CO1:** Investigate, critically analyse and evaluate the impact of new and current ICT services to an organization.
- CO2:** Demonstrate the technical and communications skills that contribute to the operation of ICT services in an organization.
- CO3:** Explain critically the role of an enterprise architect in an organization.
- CO4:** Gain Knowledge on theoretical, technical and management issues that deliver ICT services to an organization
- CO5:** Analyse how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organization.

Assessment Details (both CIE and SEE)

Evaluation Type	Component	Max. Marks	Marks Reduced To	Min Marks	Evaluation Details
Internal Assessment Test (IAT)	IAT 1	25	25	20	Average of two IATs, Scaled down to 25 Marks
	IAT 2	25			
Comprehensive Continuous Evaluation (CCE)	CCE-1	25	25		Minimum of two Assessment Methods as per 22OB4.2 of regulation. Average of CCEs, Scaled down to 25
	CCE-2	25			
Total CIE		-	50	20	Scaled down Marks of IAT and CCE to 25
SEE		100	50	18	Conducted for 100 Marks and Scaled down to 50
CIE + SEE		-	100	40	

Text Books

1. Rich Schiesser, IT Systems Management: Designing, Implementing, And Managing World-Class Infrastructure, Second Edition, Pearson, 2015.
2. Efraim Turban, Linda Volonino, Gregory Wood, IT for Management: Advancing Sustainable, Profitable Business Growth, 9th Edition, Wiley Publisher, 2015.

Reference Books:

1. Efraim Turban, Ephraim Mclean and James Wetherbe, Information Technology for Management: Transforming Organizations in the Digital Economy, 6th Edition, Wiley-India publisher, 2008.
2. Kenneth C Laudon, Jane P Laudon, Management Information Systems: Managing the Digital Firm, 15th Edition, Pearson, 2018.
3. Roger S Pressman, Software Engineering: A Practitioner's Approach, 7th Edition, McGraw Hill Education Publisher, 2009.

4. James A O'Brien, George M. Marakas, Management Information Systems, 10th Edition, McGraw-Hill Irwin Publisher, 2011.
5. Walker Royce, Software Project Management: A Unified Framework, Addison-Wesley Publisher, 1998

E - Resources:

1. <https://www.scribd.com/doc/45079962/IT-Infrastructure-Management>
2. <https://www.scribd.com/document/509694935/IT-Infrastructure-Management-eI9RGuDM0m>

CO-PO-PSO Mapping

PO'S	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3						1		2	2		2
CO2	1	1	2	2						2	1	2	2		2
CO3	2	2	2	2						2		2	2		2
CO4	2	1	1	1		2				2	1	2	2	1	2
CO5	1	3	1	1						2	1	2	2	1	2
Avg	1.6	2.0	1.8	1.8		2.0				1.8	1.0	2.0	2.0	1.3	2.0

Business Process Fundamentals

Course Code:	22IST36B	CIE Marks	50
Teaching Hours/ Week(L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40 Hours	Total Marks	100
Credits	03	Exam Hours	03

Prerequisite:

Basic Probability concepts

Course Learning Objectives:

This course will enable students to:

- CLO 1: Understand the basics of business and economy
- CLO 2: Learn the basics ethics of entrepreneurship and how to start a business.
- CLO 3: Understand the roles of ownership, management and leadership.
- CLO 4: Learn how to design an organization and its operations.
- CLO 5: Understand the roles and management of human resource in an organization.

Teaching-Learning Process(General Instructions)

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

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at-least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world-and when that's possible, it helps to improve the students' understanding.

Module– I

Teamwork & Economics

Teamwork in Business, The Foundation of Business – Introduction, Getting Down to Business, Functional Areas of Business, External Forces that Influence Business Activities

Economics and Business - What is Economics? Perfect Competition and Supply and Demand, Monopolistic Competition, Oligopoly, and Monopoly, Measuring the Health of the Economy, Government's Role in Managing the Economy

08 hours

Textbook1: Chapter 1 & 2
Teaching Learning Methodology: Chalk & Talk, Demo using Python IDE
Module–II
Ethics and Entrepreneurship Ethics – Introduction, What is Business Ethics? Identifying Ethical Issues and Dilemmas, Corporate Social Responsibility, Ethical Organizations, The Individual Approach to Ethics Entrepreneurship - The Nature of Entrepreneurship, The Importance of Small Business to the U.S. Economy, What Industries Are Small Businesses In? Advantages and Disadvantages of Business Ownership, Starting a Business, Why Some Businesses Fail and Where to Get Help
08 hours
Textbook1: Chapter 3, 4, 5 & 6
Teaching Learning Methodology: Chalk & Talk, Problem based learning: https://onlinecourses.nptel.ac.in/noc19_ee53/
Module– III
Ownership, Management and Leadership Ownership - The Ice Cream Men , Factors to Consider, Mergers and Acquisitions Management and Leadership - Noteworthy Management, What Do Managers Do?, Planning, Leading, Controlling, Managerial Skills, Applying Your Skills at Notes-4-You
08 hours
Textbook1: Chapter 7
Teaching Learning Methodology: Chalk & Talk, Problem based learning: https://onlinecourses.nptel.ac.in/noc19_ee53/
Module– IV
Organizational structures and Operation Management
Organizational structure – Organizing, Organizational Structure: How companies do the job done Operation Management - The Challenge: Producing Quality Jetboards, Operations Management in Manufacturing, Managing the Production Process in a Manufacturing Company, Graphical Tools: Gantt and PERT Charts, The Technology of Goods Production, Operations Management for Service Providers, Producing for Quality
08 hours
Textbook1: Chapter 8 & 9
Teaching Learning Methodology: Chalk & Talk, Problem based learning: https://onlinecourses.nptel.ac.in/noc22_ge04/
Module– V
Human resources and Motivating employees
Motivating Employees – Motivation, Hierarchy of Needs Theory, Two-Factor Theory, Expectancy Theory, Equity Theory Managing Human Resources - Human Resource Management, Developing Employees, What Makes a Great Place to Work? Compensation and Benefits, Performance Appraisal
08 hours

Textbook1: Chapter 10 & 11

Teaching Learning Methodology: Chalk & Talk, Problem based learning:
https://onlinecourses.nptel.ac.in/noc22_ge04/

Course Outcomes:

On completion of this course, the students will be able to:

- Design the basics of any business
- Design the rules and social responsibility of an organization.
- Develop the roles of the interrelated functions of management.
- Construct and manage an organization.
- Utilize the human resources effectively by motivating the employees.

Assessment Details (both CIE and SEE)

Evaluation Type	Component	Max. Marks	Marks Reduced To	Min Marks	Evaluation Details	
Internal Assessment Test (IAT)	IAT 1	25	25	20	Average of two IATs, Scaled down to 25 Marks	
	IAT 2	25				
Comprehensive Continuous Evaluation (CCE)	CCE-1	25	25		20	Minimum of two Assessment Methods as per 22OB4.2 of regulation. Average of CCEs, Scaled down to 25
	CCE-2	25				
Total CIE		-	50	20		Scaled down Marks of IAT and CCE to 25
SEE		100	50	18		Conducted for 100 Marks and Scaled down to 50
CIE + SEE		-	100	40		

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 (25 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:

Two Internal Assessment Test each of **25 Marks (duration 01 hour)**

1. First test at the end of 7th week of the semester
2. Second test at the end of the 14th week of the semester

Comprehensive Continuous Evaluation Tests each of **25Marks**

3. First test at the end of 4th week of the semester
4. Second test at the end of 9th week of the semester

The sum of Two Comprehensive Continuous Evaluation tests, two Internal Assessment Test will be out of 100 marks and will be **Scaled down to 50marks** (to have a less stressed CIE, the portion of the syllabus should not be

common / repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

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

Semester End Examination:

Theory SEE will be conducted by the institute as per the scheduled time table, with common question

Suggested Learning Resources:

Text Books:

1. Stephen J. Skripak, Fundamentals of Business, Pamplin college of Business and Virginia Tech Libraries, 2016.

Reference Books:

1. S.S. Kanaka, Entrepreneurial Development, S-Chand Fourth Edition.
2. Robert D. Hisrish and Michael P. Peters, Entrepreneurship, McGraw – Hill Publication.
3. Poornima M. Charantimath, Entrepreneurship Development Small Business Enterprises, Pearson Education.
4. Thomas. W. Zimmerer & Norman. M. Scarborough, Essentials of Entrepreneurship and Small Business Management, PHI.

E-RESOURCES:

- Lee Angelelli (1994). "Steve Paul Jobs." Retrieved from: <http://ei.cs.vt.edu/~history/Jobs.html>
- Warren E. Buffet and Carol Loomis (2003). "America's Growing Trade Deficit Is Selling The Nation Out From Under Us. Here's A Way To Fix The Problem--And We Need To Do It Now." Fortune. November 10, 2003. Retrieved June 9, 2016 from: http://archive.fortune.com/magazines/fortune/fortune_archive/2003/11/10/352872/index.htm
- Coca Cola Company (2016). "Our Company: Vision, Mission, and Values." Cocacola.com. Retrieved from: <http://www.coca-colacompany.com/our-company/mission-vision-values>
- Johnson and Johnson (2016). "Company Structure." Retrieved from: <http://www.jnj.com/about-jnj/company-structure>
- Burger King (2016). "About Us." Burger King Website: bk.com. Retrieved from: <http://www.bk.com/about-bk>
- Starbucks (2016). "Working at Starbucks." Starbucks.com. Retrieved from: <http://www.starbucks.com/careers/working-at-starbucks>
- Fortune (2007). "100 Top MBA Employers." Fortune. Retrieved from: http://archive.fortune.com/magazines/fortune/mba100/2007/full_list/index.html

Activity Based Learning (Suggested Activities in Class) / Practical Based learning

- Real world problem solving by giving group projects.
- Group discussion on finding suitable learning algorithm for the problem.
- Seminar on advanced techniques by the students.

CO-PO-PSO Mapping

COURSE OUTCOMES (CO's)	PROGRAM OUTCOMES (PO's)												PROGRAM SPECIFIC OUTCOMES (PSO'S)		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2							2	3		2	2			
CO2	2						3	3			2	2			
CO3	2							3	3		3	2			
CO4	2	2							3		3	2			
CO5	2							3	3		3	3			

Supply Chain Management

Course Code	22IST36C	CIE Marks	50
Teaching Hours/Week(L: T:P:S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40 Hours	Total Marks	100
Credits	03	Exam Hours	03

Course Objectives:

The objectives of this course are

- To provide Knowledge on logistics and supply chain management
- To enable them in designing the distribution network
- To train the students in knowing the supply chain Analysis
- Impart knowledge on Dimensions of logistic
- To know the recent trends in supply chain management

Syllabus

Module – I

Introduction to Supply Chain Management: Supply chain - objectives - importance - decision phases - process view competitive and supply chain strategies - achieving strategic fit – supply chain drivers - obstacles – framework – facilities -inventory-transportation-information-sourcing-pricing.

08 Hours

Module – II

Designing the distribution network: Role of distribution - factors influencing distribution - design options - e-business and its impact distribution networks in practice –network design in the supply chain - role of network - factors affecting the network design decisions modeling for supply chain. Role of transportation - modes and their performance – transportation infrastructure and policies - design options and their trade-offs tailored transportation.

08 Hours

Module – III

Supply Chain Analysis: Sourcing - In-house or Outsource - 3rd and 4th PLs - supplier scoring and assessment, selection - design collaboration - Procurement process - Sourcing planning and analysis. Pricing and revenue management for multiple customers, perishable products, seasonal demand, bulk and spot contracts.

08 Hours

Module – IV

Dimensions of Logistics: A macro and micro dimension - logistics interfaces with other areas - approach to analyzing logistics systems - logistics and systems analysis - techniques of logistics system analysis - factors affecting the cost and importance of logistics. Demand Management and Customer Service Outbound to customer logistics systems - Demand Management –Traditional Forecasting CPFRRP - customer service - expected cost of stock outs - channels of distribution.

08 Hours

Module – V

Recent Trends in Supply Chain Management-Introduction, New Developments in Supply Chain Management, Outsourcing Supply Chain Operations, Co-Maker ship, The Role of E- Commerce in Supply Chain Management, Green Supply Chain Management, Distribution Resource Planning, World Class Supply Chain Management.

08 Hours

Course Outcomes:

At the end of the course, students will be able to

- Understand the strategic role of logistic and supply chain management in the cost reduction and offering best service to the customer
- Understand Advantages of SCM in business
- Apply the knowledge of supply chain Analysis
- Analyze reengineered business processes for successful SCM implementation
- Evaluate Recent trend in supply chain management

Assessment Details (both CIE and SEE)

Evaluation Type	Component	Max. Marks	Marks Reduced To	Min Marks	Evaluation Details	
Internal Assessment Test (IAT)	IAT 1	25	25	20	Average of two IATs, Scaled down to 25 Marks	
	IAT 2	25				
Comprehensive Continuous Evaluation (CCE)	CCE-1	25	25		20	Minimum of two Assessment Methods as per 22OB4.2 of regulation. Average of CCEs, Scaled down to 25
	CCE-2	25				
Total CIE		-	50	20		Scaled down Marks of IAT and CCE to 25
SEE		100	50	18		Conducted for 100 Marks and Scaled down to 50
CIE + SEE		-	100	40		

TEXT BOOKS:

- Sunil Chopra and Peter Meindl, Supply Chain Management – “Strategy, Planning and Operation”, 3rd Edition, Pearson/PHI,2007.
- Supply Chain Management by Janat Shah Pearson Publication2008.

REFERENCE BOOKS:

- A Logistic approach to Supply Chain Management – Coyle, Bardi, Longley, Cengage Learning,1/e
- Donald J Bowersox, Dand J Closs, M Bixby Coluper, “Supply Chain Logistics Management”, 2nd edition, TMH,2008.
- Wisner, Keong Leong and Keah-Choon Tan, “Principles of Supply Chain Management A Balanced Approach”, Cengage Learning,1/e
- David Simchi-Levi et al, “Designing and Managing the Supply Chain” –Concepts

CO-PO-PSO Mapping

PO'S/ CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	-	-	-	-	-	-	-	2	2	-	2
CO2	1	1	2	2	-	-	-	-	-	-	-	2	2	-	2
CO3	2	2	2	2	-	-	-	-	-	-	-	2	2	-	2
CO4	2	1	1	1	-	-	-	-	-	-	-	2	2	1	2
CO5	1	3	1	1	-	-	-	-	-	-	-	2	2	1	2
Avg	1.6	2.0	1.8	1.8	-	-	-	-	-	-	-	2.0	2.0	1.3	2.0

HUMAN COMPUTER INTERACTION

Course Code	22IST36D	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning Objectives

- CLO 1. To learn the foundations of Human Computer Interaction.
 CLO 2. To become familiar with the design technologies for individuals and persons with disabilities.
 CLO 3. To be aware of mobile HCI.
 CLO 4. To learn the guidelines for user interface.
 CLO 5. Develop meaningful user interface.

Module - I

Introduction:

Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

08 Hours

Module - II

Design Process & Screen Designing:

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.
 Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

08 Hours

Module - III

Windows and Components

Windows – New and Navigation schemes selection of window, selection of devices based and screen-based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

08 Hours

Module - IV

HCI in the Software Process

HCI in the software process, The software life cycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction.

08 Hours

Module - V

Cognitive Models

Cognitive models Goal and task hierarchies Design Focus: GOMS saves money Linguistic models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient Wood – augmenting the physical Virtual and augmented reality Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right.

08 Hours

Teaching-Learning Process	Chalk and board, Active Learning, Demonstration, Web content, Case Study
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Course Outcomes
 On completion of this course, the students will be able to,
 CO1: Design effective dialog for HCI.
 CO2: Design effective HCI for individuals and persons with disabilities.
 CO3: Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
 CO4: Assess the importance of user feedback.
 CO5: Design and develop meaningful user interface.

Assessment Details (both CIE and SEE)

Evaluation Type	Component	Max. Marks	Marks Reduced To	Min Marks	Evaluation Details
Internal Assessment Test (IAT)	IAT 1	25	25	20	Average of two IATs, Scaled down to 25 Marks
	IAT 2	25			
Comprehensive Continuous Evaluation (CCE)	CCE-1	25	25		Minimum of two Assessment Methods as per 22OB4.2 of regulation. Average of CCEs, Scaled down to 25
	CCE-2	25			
Total CIE		-	50	20	Scaled down Marks of IAT and CCE to 25
SEE		100	50	18	Conducted for 100 Marks and Scaled down to 50
CIE + SEE		-	100	40	

Suggested Learning Resources:

Textbooks:

1. Wilbert O. Galitz, The Essential Guide to user Interface Design: An Introduction to GUI Design Principles and Techniques, Wiley, Second Edition 2002. (Module I, II, III)
2. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, Human Computer Interaction, 3rd Edition, Pearson Education, 2005 (Module IV, V)

Reference:

1. Andrew Monk, Fundamentals of Human Computer Interaction, 1st Edition, Academic Press, 2014.
2. Ben Shneiderman, Catherine Plaisant, Maxine S. Cohen, Steven M. Jacobs, Designing the User Interface: Strategies for Effective Human-Computer Interaction, 5th Edition, Pearson Education Asia Pearson, 2009
3. Brian Fling, Mobile Design and Development, First Edition, O'Reilly Media Inc., 2009
4. Bill Scott and Theresa Neil, Designing Web Interfaces, First Edition, O'Reilly, 2009.

Weblinks and Video Lectures (e-Resources):

1. <https://nptel.ac.in/courses/106103115>
2. <https://archive.nptel.ac.in/courses/106/106/106106177/>
3. https://www.tutorialspoint.com/human_computer_interface/index.htm

CO- PO-PSO Mapping:

POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	2	-	-	-	-	-	2	2	3	1	2
CO2	2	3	3	3	2	3	-	-	-	-	2	2	3	3	2
CO3	1	2	2	1	3	-	-	-	-	-	-	1	1	-	-
CO4	1	2	1	1	3	-	-	-	-	-	-	1	2	-	-
CO5	2	3	3	3	2	-	-	-	-	-	2	2	3	2	2
Avg.	1.8	2.6	2.4	2.2	2.4	3.0	-	-	-	-	2.0	1.6	2.4	2.0	2.0

Social Connect and Responsibility			
Course Code	22UHV37	CIE Marks	100
Teaching Hours/Week(L: T:P:S)	(0:0:2:0)	SEE Marks	-
Total Hours of Pedagogy	28 Hours	Total Marks	100
Credits	01	Exam Hours	-
<p>Course objectives: The course will enable the students to:</p> <ul style="list-style-type: none"> • Provide a formal platform for students to communicate and connect to the surrounding. • Create a responsible connection with the society. • Understand the community in general in which they work. • Identify the needs and problems of the community and involve them in problem –solving. • Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems. • Develop competence required for group-living and sharing of responsibilities & gain skills • In mobilizing community participation to acquire leadership qualities and democratic attitudes. 			
Syllabus			
Module – I			
<p>Plantation and adoption of a tree:</p> <p>Plantation of a tree that will be adopted for four years by a group of BE / B.Tech students. (ONE STUDENT ONE TREE) They will also make an excerpt either as a documentary or a photo blog describing the plant’s origin, its usage in daily life, its appearance in folklore and literature - – Objectives, Visit, case study, report, outcomes.</p>			
Module – II			
<p>Heritage walk and crafts corner:</p> <p>Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms - – Objectives, Visit, case study, report, outcomes.</p>			
Module – III			
<p>Organic farming and waste management:</p> <p>efulness of organic farming, wet waste management in neighboring villages, and plementation in the campus – Objectives, Visit, case study, report, outcomes.</p>			
Module – IV			
<p>Water conservation:</p> <p>Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photoblog presenting the current practices – Objectives, Visit, case study, report, outcomes.</p>			
Module – V			
<p>Foods walk:</p> <p>City’s culinary practices, food lore, and indigenous materials of the region used in cooking – Objectives, Visit, case study,report, outcomes.</p>			

Course Outcomes:

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

CO1: Communicate and connect to the surrounding.

CO2: Create a responsible connection with the society.

CO3: Involve in the community in general in which they work.

CO4: Develop among them of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.

CO5: Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

Pedagogy – Guidelines:

It may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution.

Sl No	Topic	Groupsize	Location	Activity execution	Reporting	Evaluation Of the Topic
1.	Plantation and adoption of a tree:	May be individual or team	Farmers land/ parks / Villages / roadside/ community area / College campus etc.....	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submit by individual to the concerned evaluation authority	Evaluation as per the rubricsOf scheme and syllabus by Faculty
2.	Heritage walk and crafts corner:	May be individual or team	Temples / monumental places / Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc.....	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubricsOf scheme and syllabus by Faculty
3.	Organic farming and waste management:	May be individual or team	Farmers land / parks / Villages visits / roadside/ community area / College campus etc.....	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubricsOf scheme and syllabus by Faculty
4.	Water conservation: & conservation techniques	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers / campus etc.....	site selection / proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubricsOf scheme and syllabus by Faculty
5.	Food walk: Practices in society	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubricsOf scheme and syllabus by Faculty

Plan of Action (Execution of Activities)

Sl.No.	Practice Session Description
1	Lecture session in field to start activities
2	Students Presentation on Ideas
3	Commencement of activity and its progress
4	Execution of Activity
5	Execution of Activity
6	Execution of Activity
7	Execution of Activity
8	Case study based Assessment, Individual performance
9	Sector/ Team wise study and its consolidation
10	Video based seminar for 10 minutes by each student At the end of semester with Report.

- Each student should do activities according to the scheme and syllabus.
- At the end of semester student performance has to be evaluated by the faculty for the assigned activity progress and its completion.
- At last consolidated report of all activities from 1st to 5th, compiled report should be submitted as per the instructions and scheme.

Assessment Details for CIE (both CIE and SEE)

Weightage	CIE – 100%	<ul style="list-style-type: none"> • Implementation strategies of the project (NSS work). • The last report should be signed by NSS Officer, the HOD and principal. • At last report should be evaluated by the NSS officer of the institute. • Finally the consolidated marks sheet should be sent to the university and also to be made available at LIC visit.
Field Visit, Plan, Discussion	10 Marks	
Commencement of activities and its progress	20 Marks	
Case study based Assessment Individual performance with report	20 Marks	
Sector wise study & its consolidation 5*5 = 25	25 Marks	
Video based seminar for 10 minutes by each student At the end of semester with Report. Activities 1 to 5, 5*5 = 25	25 Marks	
Total marks for the course in each semester	100 Marks	

For each activity, 20 marks CIE will be evaluated for IA marks at the end of semester, Report and assessment copy should be made available in the department.

- Students should present the progress of the activities as per the schedule in the prescribed practical session in the field.
- There should be positive progress in the vertical order for the benefit of society in general through activities.

Activities:

Jamming session, open mic, and poetry: Platform to connect to others. Share the stories with others. Share the experience of Social Connect. Exhibit the talent like playing instruments, singing, one-act play, art-painting, and fine art.

PEDAGOGY:

The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion, and a course project. Applying and synthesizing information from these sources to define the social problem to address and take up the solution as the course project, with your group. Social immersion with NGOs/social sections will be a key part of the course. Will all lead to the course project that will address the needs of the social sector.

COURSE TOPICS:

The course will introduce social context and various players in the social space, and present approaches to discovering and understanding social needs. Social immersion and inspiring conversational will culminate in developing an actual, idea for problem-based intervention, based on an in-depth understanding of a key social problem.

Duration:

A total of 40 - 50 hrs engagement per semester is required for the 3rd semester of the B.E./B.Tech. Program. The students will be divided into groups. Each group will be handled by faculty mentor. Faculty mentor will design the activities (particularly Jamming sessions open mic, and poetry) Faculty mentors has to design the evaluation system as per VTU guidelines of scheme & syllabus.

Guideline for Assessment Process:**Continuous Internal Evaluation (CIE):**

After completion of the course, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor. The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed. Marks allotted for the diary are out of 50. Planning and scheduling the social connect Information/Data collected during the social connect Analysis of the information/data and report writing Considering all above points allotting the marks as mentioned below

Excellent**: 80 to 100****Good****: 60 to 79****Satisfactory****: 40 to 59 Unsatisfactory and fail: <39**

Unified Modeling Language Tools - STAR UML			
Course Code	22ISL38A	CIE Marks	50
Teaching Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	12 Lab slots	Total Marks	100
Credits	01	Exam Hours	03
Course objectives:			
This course will enable students to experience practically on:			
<ul style="list-style-type: none"> • Master Object-Oriented Principles and UML Fundamentals for a Strong Foundation□ • Attain a comprehensive grasp on UML application and design diagram utilization • Acquire knowledge of iterative, incremental, and development processes • Examine Extreme Programming (XP) principles through comprehensive study and practical application□ • Discover and apply key design patterns in practical contexts for hands-on experience. 			
PROGRAMS			
1	Imagine you are tasked with developing a comprehensive UML diagram for an Automated Teller Machine (ATM) application. The ATM system should support basic banking transactions such as cash withdrawals, balance inquiries, and fund transfers.		
2	Describe the UML representation of interactions in a Library Management System's bookborrowing process, emphasizing actor roles, event flow, decision points, and ensuring scalability for future system enhancements.		
3	Design an UML representation of interactions in an Online Book Shop, emphasizing systemcomponents, user roles, transaction processes, and scalability features for future enhancements.		
4	Design the UML diagram for a Railway Reservation System, emphasizing interactions, user roles,booking processes, and scalability features tailored for accommodating future system enhancements.		
5	Demonstrate the UML representation of the Banking System's Account Transfer Process, highlighting interactions, user roles, transaction sequence, security measures, validation, exception handling, and scalability for future enhancements.		
6	Draw a model for Airport management system in different views i.e. Use case view, logical view, component view, Deployment view, Database design, forward and Reverse Engineering, and Generation of documentation of the project.		
7	Draw a model for E-commerce sites in different views i.e Use case view, logical vie component view, Deployment view,Database design, forward and Reverse Engineering, and Generation of documentation of the project.		
8	Design Activity and Class Diagram for Hospital management system to demonstrate the Activitiwhich will be carried out in Hospital.		
Course Outcomes:			
On completion of this course, the students will be able to:			
<p>CO1:Analyze complex problems, design effective solutions and communicate their ideas through UML diagrams.</p>			

Introduction to MATLAB / SCILAB

Course Code	22ISL38B	CIE Marks	50
Teaching Hours/Week (L: T:P:S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	-	Total Marks	100
Credits	01	Exam Hours	03

SCILAB stands for *SCIENTIFIC LABORATORY* is an *open-source alternative* to MATLAB. SCILAB is free and open-source software for numerical computation providing a powerful computing environment for engineering and scientific applications. SCILAB software is used for performing numerical computation. It is used in all major scientific areas such as space, aeronautics, defense, finance, etc.

Course Objectives:

1. To become familiar with SCILAB programming environment including Maths & Simulation for usual engineering and science applications including mathematical operations and data analysis.
2. To implement elementary mathematical functions, polynomial arithmetic, scalar and vector operations.
3. To develop programming for 2-D & 3-D Visualization Graphics functions to visualize, annotate and export data and many ways to create and customize various types of plots and charts.
4. To develop optimization Algorithms to solve constrained and unconstrained continuous and discrete optimization problems.
5. To explore the statistics tools to perform data analysis and modeling.

Course Content:

Programs/Assignment on:

1. SCILAB Introduction and Vector Operations, Variables and Matrix Operations
2. Conditional Branching, Iterations and Loops Scripts Functions
3. Toolboxes and SCILAB Applications using Garuda Cloud
4. 2D, 3D Graphs and Advanced Plotting Commands
5. Image Processing Toolbox and Implementation of Face and Eye Detection Techniques
6. Curve Fitting, Polynomials and Differential Equations with OpenCV/ SCILAB
7. Simulation using XCOS
8. Numerical Optimization Techniques and Artificial Intelligence

Course Outcomes

CO1: Explain the SCILAB programming environment to solve given problem.

CO2: Develop algorithms to implement elementary mathematical functions, polynomial arithmetic, scalar and vector operations.

CO3: Analyze the working of 2D, 3D Graphs and Advanced Plotting.

CO4: Designing the optimization techniques for efficient solutions.

CO5: Implementation of SCILAB programs to solve real world problems.

Assessment Details (both CIE and SEE)

Continuous Internal Assessment of Laboratory/Practical Courses		
Lab Test 1	Lab Test 2	Lab Records
15 marks	15 marks	20 marks
Semester End Examination (SEE)		50 marks

CO-PO and PSO Mapping

PO's CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	2	-	-	-	-	-	3	3	3	3	2
CO2	3	3	3	3	3	-	-	-	-	-	3	3	2	2	2
CO3	3	3	3	2	2	-	-	-	-	-	3	3	3	3	1
CO4	3	3	3	3	3	-	-	-	-	-	3	3	3	3	2
CO5	3	3	3	3	3	-	-	-	-	-	3	3	3	3	3
Avg.	3	3	3	2.8	2.6	-	-	-	-	-	3	3	2.8	2.8	2

Introduction to Office Tools

Course Code	22ISL38C	CIE Marks	50
Teaching Hours/Week (L: T:P:S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	-	Total Marks	100
Credits	01	Exam Hours	03

Course Objectives:

1. Attain a comprehensive understanding of Microsoft Office tools including Word, Excel, PowerPoint, and potentially others like Access, Outlook, or Publisher.
2. Learn how to use Office tools effectively to increase productivity in academic, professional, and personal tasks.
3. Develop the ability to adapt and apply acquired skills to different scenarios and tasks requiring Office applications.

Course Content:

Programs/Assignment on:

Microsoft Word:

1. Using MS WORD formatting tools like font styles, sizes, colors, alignment, and line spacing.
2. Using MS WORD Create and customize document templates for different purposes (e.g., resumes, flyers, reports).
3. Explore creating and formatting tables, inserting and formatting images, shapes, and SmartArt.
4. Introduce basic arithmetic operations, SUM, AVERAGE, MAX, MIN, etc.

Microsoft PowerPoint:

5. Creating Presentations: Cover slide layouts, inserting text, images, shapes, and slide transitions.
6. Animation and Multimedia: Practice adding animations, audio, video, and customizing timing.
7. Master Slides: Explore using master slides for consistent formatting and design.
8. Microsoft Access: Design and create a simple database, define relationships, and run

queries.

9. Outlook: Manage emails, calendar appointments, tasks, and rules for organizing mail.
10. OneNote: Explore note-taking, organizing information, and collaboration features.
11. Publisher: Designing various print materials like newsletters, brochures, or posters.
12. SharePoint: Introduction to document management, team sites, and collaboration tools.

Course Outcomes

CO1: Explain the usage of Microsoft Office environment to solve given problem.

CO2: Demonstrate the working of Microsoft Office tools.

CO3: Analyze the working of Word, Excel and PowerPoint settings to create the documents.

CO4: Designing the animated presentation to explore the Critical thinking.

CO5: Implementation of efficient Microsoft Office tools programs to solve real world problems for better productivity.

Assessment Details (both CIE and SEE)

Continuous Internal Assessment of Laboratory/Practical Courses		
Lab Test 1	Lab Test 2	Lab Records
15 marks	15 marks	20 marks
Semester End Examination (SEE)		50 marks

CO-PO and PSO Mapping

PO's CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	2	-	-	-	-	-	3	3	3	3	2
CO2	3	3	3	3	3	-	-	-	-	-	3	3	2	2	2
CO3	3	3	3	2	2	-	-	-	-	-	3	3	3	3	1
CO4	3	3	3	3	3	-	-	-	-	-	3	3	3	3	2
CO5	3	3	3	3	3	-	-	-	-	-	3	3	3	3	3
Avg.	3	3	3	2.8	2.6	-	-	-	-	-	3	3	2.8	2.8	2

Introduction to Linux/Unix Shell Programming			
Course Code	22ISL38D	CIE Marks	50
Teaching Hours/Week (L: T:P:S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	-	Total Marks	100
Credits	01	Exam Hours	03
Course Objectives:			
<p>This course will enable students to,</p> <ol style="list-style-type: none"> 1. Understand effective use of Unix concepts, commands and terminology. 2. Identify, access, and evaluate UNIX file system. 3. Understand UNIX command syntax and semantics. 4. Read and understand specifications, scripts and programs. 5. Analyze Facility with UNIX Process. 			
Course Content:			
Introduction to Shell scripting:			
<ul style="list-style-type: none"> • Use of Basic UNIX Shell Commands and options related to them: vi, ls, mkdir, rmdir, cd, cat, touch, file, wc, sort, cut, who, man etc. • Commands related to inode, I/O redirection and piping. • Shell Programming: Shell script exercises based on following: <ol style="list-style-type: none"> (i) Interactive shell scripts (ii) Positional parameters (iii) Arithmetic (iv) if-then-fi, if-then- else-fi, nested if-else (v) Logical operators (vi) else + if equals elif, case structure (vii) while, until, for loops, use of break 			
Programs/Assignment on:			
<ol style="list-style-type: none"> 1. Write a shell script to check whether the entered username and password is valid or not. 2. Write a shell script to add, subtract, multiply, divide two numbers and add two strings. 3. Write a shell script that accepts two file names as arguments, and checks the permissions of these files are similar or different. 4. Write a shell program to perform convert lowercase to uppercase using tr statement. 5. Write a non-recursive shell script that accepts any number of arguments and prints them in a reverse order. 6. Write a shell script to check the given file is a directory or not. 7. Write a shell script to compute GCD & LCM of two numbers. 8. Write a shell script to find whether a given number is prime. 9. Write a shell script to check whether the given year is Leap year or not. 10. Write a shell script to check whether the given string is Palindrome or not. 			

Course Outcomes

- CO1:** Know the basics of Unix concepts and commands.
CO2: Evaluate the UNIX file system.
CO3: Apply Changes in file system.
CO4: Write scripts and programs.
CO5: Analyse Facility with UNIX system process.

Text Book:

- 1) Sumitabha Das: “UNIX – Concepts and Applications”, Tata McGraw Hill, Noida, 4th Edition, 15th Reprint, 2011, ISBN-13: 978-0-07-063546-3.
- 2) Behrouz A. Forouzan and Richard F. Gilberg: “UNIX and Shell programming”, Cengage Learning, India, 1st Edition, 2005, ISBN: 81-35-0325-9.
- 3) M G Venkatesh Murthy: “UNIX and Shell programming”, Pearson Education, Delhi, 1st Edition, 2005, ISBN: 81-7758-745-5.

E-Resources:

- 1) <http://www.mhhe.com/das/uca>
- 2) http://www.tutorialspoint.com/unix/unix_tutorials.pdf.
- 3) <http://www.perldoc.perl.org/>

Assessment Details (both CIE and SEE)

Continuous Internal Assessment of Laboratory/Practical Courses		
Lab Test 1	Lab Test 2	Lab Records
15 marks	15 marks	20 marks
Semester End Examination (SEE)		50 marks

CO-PO and PSO Mapping

PO's CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	2	-	-	-	-	-	3	3	3	3	2
CO2	3	3	3	3	3	-	-	-	-	-	3	3	2	2	2
CO3	3	3	3	2	2	-	-	-	-	-	3	3	3	3	1
CO4	3	3	3	3	3	-	-	-	-	-	3	3	3	3	2
CO5	3	3	3	3	3	-	-	-	-	-	3	3	3	3	3
Avg.	3	3	3	2.8	2.6	-	-	-	-	-	3	3	2.8	2.8	2



Nagarjuna College of Engineering & Technology, Bengaluru

An Autonomous Institute, Affiliated to VTU Belagavi

Scheme & Syllabus of V Semester ISE

**As per the NEP 2020 Guidelines,
Choice-Based Credit System
&
Outcome-Based Education**

Information Science & Engineering

w.e.f.

Academic Year 2023-2024

VISION

To disseminate the IT knowledge among the students for achieving excellence in education and to irradiate budding engineers as leaders in information technology.

MISSION

M1: To maintain leadership and excellence in Information Technology.

M2: Achieving excellence in IT through analysis, design, development of software products

M3: Developing communication skills, leadership qualities and team work among students' community by providing opportunities to work on various projects through internship with industry partners

M4: To inculcate Ethics and Human values for solving societal problems and environmental protection.

M5: Promoting research, higher studies and entrepreneurship among the students through outside world interaction

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates of Information Science and Engineering are expected to fulfil the following PEOs after a few years of their graduation.

PEO1: Pursue a successful career in the field of Information Science & Engineering or a related field utilizing his/her education and contribute to the profession as an excellent employee, or as an entrepreneur.

PEO2: Be able to work effectively in multidisciplinary environments and be responsible members/leaders of their communities

PEO3: The graduates of Information Science and Engineering Program should be able to establish an understanding of professionalism, teamwork, ethics, public policy that allows them to become good professional Engineers

PEO4: The graduates of Information Science and Engineering Program should be able to provide novel engineering solutions and efficient software designs with legal and ethical responsibility.

PEO5: Continuously improve by pursuing advanced degrees in engineering, business, or other professional fields through formal means or through informal self-study.

PROGRAM OUTCOMES (POs)

Graduates of the Information Science and Engineering Programme will be able to achieve the following POs:

PO1: Engineering Knowledge

Apply the knowledge of mathematics, science, engineering fundamentals, and Information Science and Engineering principles to the solution of complex problems in Information Science and Engineering.

PO2: Problem Analysis

Identify, formulate, research literature, and analyze complex Information Science and Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO3: Design/Development of Solutions

Design solutions for complex Information Science and Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of Complex problems

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions related to Information Science and Engineering problems.

PO5: Modern Tool Usage

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex Information Science and Engineering activities with an understanding of the limitations.

PO6: The Engineer and Society

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Information Science and Engineering practice.

PO7: Environment and Sustainability

Understand the impact of the professional **Information Science and Engineering** solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics

Apply ethical principles and commit to professional ethics and responsibilities and norms of the Information Science and Engineering practice.

PO9: Individual and Team work

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication

Communicate effectively on complex Information Science and Engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage Information Science and Engineering projects and in multidisciplinary environments.

PO12: Life Long Learning

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Program Specific Outcomes (PSOs) are what the graduates of a specific undergraduate engineering program should be able to do at the time of graduation.

PSO1: Professional Skills

The ability to understand, analyze and develop algorithms and write Information application programs in the areas related to information technology

PSO2: Problem-Solving Skills

Ability to understand the ethics, human values for solving societal problems and environmental protection

PSO3: Foundation of mathematical concepts

Ability to understand the software development skills and practical knowledge for promoting research, higher studies and entrepreneurship.

SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

Course Code	21IST51	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Prerequisites: Software Development Life Cycle (SDLC), Scripting Language, Version Control Tool, Database

Course Learning Objectives

- CLO 1. Outline software engineering principles and activities involved in building large software programs. Identify ethical and professional issues and explain why they are of concern to Software Engineers.
- CLO 2. Describe the process of requirement gathering, requirement classification, requirement specification and requirements validation.
- CLO 3. Infer the fundamentals of object oriented concepts, differentiate system models, use UML diagrams and apply design patterns.
- CLO 4. Explain the role of DevOps in Agile Implementation.
- CLO 5. Discuss various types of software testing practices and software evolution processes.

Teaching-Learning Process (General Instructions)

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

1. Lecturer methods (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students understanding.

Module - I

Introduction: The evolving role of software, Software, The changing nature of software, Software engineering, A Process Framework, Process Patterns, Process Assessment, Personal and Team Process Models, Process Technology, Product and Process. **(Textbook 1: Chapter 1: 1.1 to 1.3)**

Process Models: Prescriptive models, Waterfall model, Incremental process models, Evolutionary process models, Specialized process models. **(Textbook 1: Chapter 2: 2.1, 2.2, 2.4 to 2.7)**

08 Hours

Module - II

Introduction, Modelling Concepts and Class Modelling: What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling, abstraction, The Three models. Class Modelling: Object and Class Concept, Link and associations concepts, Generalization and Inheritance.

(Textbook 2: Chapter 1,2,3)

Building the Analysis Models: A sample class model, Navigation of class models, Introduction to RUP **(Textbook: 5 Sec 2.4)** and UML diagrams Requirement Analysis, Analysis Model Approaches, Data modeling Concepts, **(Textbook 1: Chapter 8: 8.1 to 8.8)**

08 Hours

Module - III

Software Testing: A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object -Oriented Software, Validation Testing, System Testing, The Art of Debugging.(**Textbook 1: Chapter 13: 13.1 to 13.7**)

Agile Methodology & DevOps: Before Agile – Waterfall, Agile Development,

Self-Learning Section: What is DevOps?, DevOps Importance and Benefits, DevOps Principles and Practices, 7 C's of DevOps Lifecycle for Business Agility, DevOps and Continuous Testing, How to Choose Right DevOps Tools?, Challenges with DevOps Implementation.(**Textbook 4: Chapter 2: 2.1 to 2.9**)

08 Hours

Module - IV

Introduction to Project Management:

Introduction, Project and Importance of Project Management, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some ways of categorizing Software Projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, Management and Management Control, Project Management life cycle,(**Textbook 3: Chapter 1: 1.1 to 1.17**)

08 Hours

Module - V

Activity Planning:

Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass– Backward Pass(**Textbook 3: Chapter 6: 6.1 to 6.16**)

Software Quality: Introduction, The place of software quality in project planning, Importance of software quality, software quality models, ISO 9126, quality management systems, process capability models, techniques to enhance software quality, quality plans. (**Textbook 3: Chapter 13: (13.1 to 13.6 , 13.9, 13.11, 13.14)**)

08 Hours

Teaching-Learning Process

Chalk and board, Active Learning, Demonstration

Course Outcomes

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

- CO 1. Understand the activities involved in software engineering and analyze the role of various process models
- CO 2. Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques
- CO 3. Describe various software testing methods and to understand the importance of agile methodology and DevOps
- CO 4. Illustrate the role of project planning and quality management in software development
- CO 5. Understand the importance of activity planning and different planning models

Assessment Details (both CIE and SEE)

Component		Weightage (%)	
CIE's	CIE 1 5 th week	20	60
	CIE 2 10 th week	20	
	CIE 3 15 th week	20	
AAT's	AAT-1 10 th week	10	
	AAT-2	10	
	AAT-3	20	
Continuous Internal Evaluation Total Marks: 100. Reduced to 50 Marks			
Semester End Examination (SEE) Total Marks: 100. Reduced to 50 Marks			

Suggested Learning Resources:**Textbooks**

1. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.
2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML, 2nd Edition, Pearson Education, 2005.
3. Bob Hughes, Mike Cotterell, Rajib Mall: Software Project Management, 6th Edition, McGraw Hill Education, 2018.
4. Deepak Gaikwad, Viral Thakkar, DevOps Tools from Practitioner's Viewpoint, Wiley.
5. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012.

Reference:

1. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.

Weblinks and Video Lectures (e-Resources):

1. https://onlinecourses.nptel.ac.in/noc20_cs68/preview
2. https://www.youtube.com/watch?v=WxkP5KR_Emk&list=PLrjkTql3jnm9b5nr-ggx7Pt1G4UAHeFIJ
3. <http://elearning.vtu.ac.in/econtent/CSE.php>
4. <http://elearning.vtu.ac.in/econtent/courses/video/CSE/15CS42.html>
5. <https://nptel.ac.in/courses/128/106/128106012/> (DevOps)

CO-PO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2	2	-	-	-	-	2	2	-	1	2	-	2
CO2	2	2	2	2	3	-	-	-	2	2	-	1	2	-	2
CO3	2	-	3	2	3	-	-	-	3	3	-	2	2	-	2
CO4	1	2	2	2	3	2	2	2	3	3	3	3	2	-	2
CO5	3	3	3	2	3	2	2	-	-	2	3	2	-	3	2

DATA MINING AND DATA WAREHOUSING (IC)

Course Code	21ISI52	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	04	Exam Hours	03
Course Learning Objectives			
<p>CLO 1. Identify the scope and necessity of Data Mining and Warehousing for the society.</p> <p>CLO 2. Describe various Data Models and Design Methodologies of Data Warehousing destined to solve the root problems.</p> <p>CLO 3. Understand various Tools of Data Mining and their Techniques to solve the real time problems.</p> <p>CLO 4. Learn how to analyze the data, identify the problems, and choose the relevant algorithms to apply.</p> <p>CLO 5. Assess the Pros and Cons of various algorithms and analyze their behavior on real datasets.</p>			
Module - I			
<p>Data Mining: Introduction - Steps in KDD - System Architecture – Types of data -Data mining functionalities - Classification of data mining systems - Integration of a data mining system with a data warehouse - Issues - Data Preprocessing - Data Mining Application.</p>			
			08 Hours
Module - II			
<p>Data Warehousing: Data warehousing components - Building a data warehouse - Multi Dimensional Data Model - OLAP Operation in the Multi- Dimensional Model - Three Tier Data Warehouse Architecture - Schemas for Multi-dimensional data Model - Online Analytical Processing (OLAP) - OLAP Vs OLTP Integrated OLAM and OLAP Architecture.</p>			
			08 Hours
Module - III			
<p>Association Rule Mining: Mining frequent patterns - Associations and correlations - Mining methods Finding Frequent itemset using Candidate Generation - Generating Association Rules from Frequent Item sets - Mining Frequent itemset without Candidate Generation Mining various kinds of association rules - Mining Multi-Level Association Rule-Mining Multidimensional Association Rule- Mining Correlation analysis - Constraint based association mining.</p>			
			08 Hours
Module - IV			
<p>Classification and Prediction: Classification and prediction - Issues Regarding Classification and Prediction - Classification by Decision Tree Induction - Bayesian classification – Bayes’ Theorem - Naïve Bayesian Classification - Bayesian Belief Network - Rule based classification - Classification by Back propagation - Support vector machines - Prediction -Linear Regression.</p>			
			08 Hours
Module - V			
<p>Clustering, Applications and Trends In Data Mining: Cluster analysis - Types of data in Cluster Analysis - Categorization of major clustering methods - Partitioning methods – Hierarchical methods - Density-based methods - Grid-based methods - Model based clustering methods -Constraint Based cluster analysis - Outlier analysis - Social Impacts of Data Mining- Case Studies: Mining WWW- Mining Text Database- Mining Spatial Databases.</p>			
			08 Hours
Teaching-Learning Process	Chalk and board, Active Learning, Demonstration		

Lab Programs

1. Installation of WEKA Tool
2. Creating new Arff File
3. Pre-Processes Techniques on Data Set and Pre-process a given dataset based on Handling Missing Values
4. Generate Association Rules using the Apriori Algorithm
5. Generating association rules using fp-growth algorithm
6. Build a Decision Tree by using J48algorithm
7. Naïve bayes classification on a given data set
8. Applying k-means clustering on a given data set
9. Calculating Information gains measures
10. OLAP Cube and its different operations

Course Outcomes

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

CO1: Assess Raw Input Data and process it to provide suitable input for a range of data mining algorithm

CO2: Design and Modelling of Data Warehouse

CO3: Discover interesting pattern from large amount of data

CO4: Design and Deploy appropriate Classification Techniques

CO5: Able to cluster high dimensional data

Assessment Details (both CIE and SEE)

Component		Weightage (%)	
CIE's	CIE 1 5 th week	20	20
	CIE 2 10 th week	20	
	CIE 3 15 th week	20	
AAT's	AAT-1 4 th week	10	
	Lab Test	10	
	Lab Records	10	
Continuous Internal Evaluation Total Marks: 60 Reduced to 20 Marks			
Semester End Examination (SEE) Total Marks: Reduced to 30 Marks			

Suggested Learning Resources:

Textbooks

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", 2ndEdition, Elsevier, 2007, ISBN-10 9789380931913, ISBN-13-978-9380931913.
2. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Published by Tata McGraw-Hill Education Pvt. Ltd., 2004, ISBN 10: 0070587418 / ISBN 13: 9780070587410.
3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Person Education, 2007.ISBN-13-9788131714720, ISBN-10-8131714720.
4. G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006, ISBN-13:9788120350021, ISBN - 10 :8120350022.
5. Daniel T. Larose, "Data Mining Methods and Models", Publisher-John Wiley & Sons, 2006, 2006, ISBN 8126507764, 9788126507764.

Reference:

1. Pieter Adriagus, Dolf Zantinge, "Data Mining", Addison-Wesley Publisher, Pearson education, 2007, ISBN 978-81-317-0717-3.
2. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World", Pearson education, ISBN 978-81-317-0459-2, 2009.

Weblinks and Video Lectures (e-Resources):

1. <https://study.com/academy/lesson/data-warehousing-and-data-mining-information-for-business-intelligence.html>
2. <http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-Series-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and-Techniques-3rd-Edition-Morgan-Kaufmann-2011.pdf>
3. <https://www-users.cs.umn.edu/~kumar001/dmbook/index.php>

CO - PO- PSO Mapping

	Program Outcomes												Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	-	-	2	3	-	-	-	-	-	-	-	-	2	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	2	3	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	-	2	-
AVG	2.5	2.5	2	3	0	-	-	-	-	-	-	2	3.5	2	0

INTERNET OF THINGS

Course Code	21IST53	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Prerequisite: Networking, Sensors.

Course Learning Objectives

- CLO 1. Understand about the fundamentals of Internet of Things and its building blocks along with their characteristics.
- CLO 2. Understand the recent application domains of IoT in everyday life.
- CLO 3. Understand the protocols and standards designed for IoT and the current research on it.
- CLO 4. Understand the other associated technologies like cloud and fog computing in the domain of IoT.
- CLO 5. Improve their knowledge about the various cutting-edge technologies in the field IoT and machine learning applications.

Teaching-Learning Process (General Instructions)

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

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module - I

Emergence of IoT: Introduction, Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components, Addressing Strategies in IoT.
(Textbook 1: Chapter 4 – 4.1 to 4.5)

08 Hours

Module - II

IoT Sensing and Actuation: Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics.
(Textbook 1: Chapter 5 – 5.1 to 5.9)

08 Hours

Module - III

IoT Processing Topologies and Types: Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading.
(Textbook 1: Chapter 6 – 6.1 to 6.5)

08 Hours**Module - IV**

IoT Connectivity Technologies: Introduction, IEEE 802.15.4, Zigbee, Thread, ISA100.11A, Wireless HART, RFID, NFC, DASH7, Z-Wave, Weightless, Sigfox, LoRa, NB-IoT, Wi-Fi, Bluetooth
(Textbook 1: Chapter 7 – 7.1 to 7.16)

08 Hours**Module - V**

IoT Communication Technologies: Introduction, Infrastructure Protocols, Discovery Protocols, Data Protocols, Identification Protocols, Device Management, Semantic Protocols
(Textbook 1: Chapter 8 – 8.1, 6.2, 8.3, 8.4, 8.5, 8.6, 8.7)

IoT Interoperability: Introduction, Taxonomy of interoperability, Standards, Frameworks
(Textbook 1: Chapter 9 – 9.1, 9.2, 9.3)

08 Hours**Teaching-Learning Process for allmodules**

Chalk & board, Problem based learning, MOOC, Demonstration

Course Outcomes

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

- CO 1. Understand the evolution of IoT, IoT networking components, and addressing strategies in IoT.
- CO 2. Analyze various sensing devices and actuator types.
- CO 3. Demonstrate the processing in IoT.
- CO 4. Apply different connectivity technologies.
- CO 5. Understand the communication technologies, protocols and interoperability in IoT.

Assessment Details (both CIE and SEE)

Component		Weightage (%)	
CIE's	CIE 1 5 th week	20	60
	CIE 2 10 th week	20	
	CIE 3 15 th week	20	
AAT's	AAT-1 10 th week	10	
	AAT-2	10	
	AAT-3	20	
Continuous Internal Evaluation Total Marks: 100. Reduced to 50Marks			
Semester End Examination (SEE) Total Marks: 100. Reduced to 50Marks			

Textbook:

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press 2021.

Reference:

1. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
2. Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

Weblinks and Video Lectures (e-Resources):

1. <https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs31/>

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	2	-	-	-	-	-	3	1	2	-	3
CO2	2	3	2	2	1	-	-	-	-	-	2	1	-	3	2
CO3	3	3	3	3	2	-	-	-	-	-	2	1	-	3	3
CO4	1	3	2	2	3	-	-	-	-	-	3	1	2	-	2
CO5	2	2	2	1	3	-	-	3	-	3	2	1	-	2	3
Avg	2.2	2.6	2	2	2.2	-	-	3	-	3	2.4	1	2	2.6	2.6

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Course Code	21IST54	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Pre-Requisites:

1. Mathematics, Probability and statistics.
2. Knowledge in programming Language.
Fundamentals of AI and ML algorithms

Course Learning Objectives

- CLO 1. Gain a historical perspective of AI and its foundations
- CLO 2. Familiarize with the basics of Machine Learning & Machine Learning process, basics of Decision Tree, and probability learning
- CLO 3 Understand the working of Artificial Neural Networks and basic concepts of clustering algorithms
- CLO 4. How to evaluate hypothesis for learning and Bayesian algorithms

Module - I

Introduction: What is AI? Foundations and History of AI

Problem-solving: Problem-solving agents, Example problems, Searching for Solutions, Uninformed Search Strategies: Breadth First search, Depth First Search

08 Hours

Module - II

Introduction: Well posed learning problems, designing a learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

08 Hours

Module - III

Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

08 Hours

Module - IV

Artificial Neural Networks: Introduction, Neural Network representation, Perceptron's

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning Naive Bayes classifier, Bayesian belief networks.

08 Hours

Module - V

Evaluating Hypothesis: Motivation, Estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms.

Instance Based Learning: Introduction, k-nearest neighbour learning

08 Hours

Course outcomes:

After studying this course, the students will be able to:

- CO1: Choose the learning techniques and investigate concept learning.
- CO2: Identify the characteristics of decision tree and solve problems associated with.
- CO3: Apply effectively neural networks for appropriate applications.
- CO4: Apply Bayesian techniques and derive effectively learning rules.
- CO5: Evaluate hypothesis and investigate instance based learning and reinforced learning.

Assessment Details (both CIE and SEE)

Component		Weightage (%)	
CIE's	CIE 1 5 th week	20	60
	CIE 2 10 th week	20	
	CIE 3 15 th week	20	
AAT's	AAT-1 10 th week	10	
	AAT-2	10	
	AAT-3	20	
Continuous Internal Evaluation Total Marks: 100. Reduced to 50Marks			
Semester End Examination (SEE) Total Marks: 100. Reduced to 50Marks			

Suggested Learning Resources:

Text Books

1. Tom M. Mitchell, "Machine Learning", (Chapters: 1.1–1.3, 2.1-2.5, 2.7, 3.1-3.7, 4.1–4.6, 6.1–6.6, 6.9, 6.11, 6.12, 5.1-5.6, 8.1-8.5, 13.1-13.3), India Edition, 2013, McGraw Hill Education.
2. Stuart J. Russell and Peter Norvig, Artificial Intelligence, 3rd Edition, Pearson, 2015 (Chapter 1- 1.1, 1.2, 1.3 Textbook 1: Chapter 3- 3.1, 3.2, 3.3, 3.4.1, 3.4.3)

Reference Books:

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", 2nd Edition, Springer series in statistics.
2. Ethem Alpaydin, "Introduction to Machine Learning", 2nd Edition, MIT press

E - Resources:

1. <https://www.kdnuggets.com/2019/11/10-free-must-read-books-ai.html>
2. <https://www.udacity.com/course/knowledge-based-ai-cognitive-systems--ud409>
3. <https://nptel.ac.in/courses/106/105/106105077/>
4. <https://www.javatpoint.com/history-of-artificial-intelligence>
5. <https://www.tutorialandexample.com/problem-solving-in-artificial-intelligence>
6. <https://techvidvan.com/tutorials/ai-heuristic-search/>
7. <https://www.analyticsvidhya.com/machine-learning/>
8. <https://www.javatpoint.com/decision-tree-induction>
9. <https://www.hackerearth.com/practice/machine-learning/machine-learning-algorithms/mldecision-tree/tutorial/>
10. <https://www.javatpoint.com/unsupervised-artificial-neural-networks>

COs, POs and PSOs Mapping

POs, PSOs COs	P	PO	PSO	PSO	PSO											
	O1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	2	1	2	2	-	-	-	-	-	3	1	2	-	2	
CO2	3	3	2	2	1	-	-	-	-	-	2	1	-	3	3	
CO3	3	3	3	2	2	-	-	-	-	-	2	1	-	3	3	
CO4	3	3	2	2	3	-	-	-	-	-	2	1	2	-	2	
CO5	2	2	2	2	3	-	-	-	-	3	3	1	-	3	2	

INTERNET OF THINGS LAB			
Course Code	21ISL55	CIE Marks	50
Teaching Hours/Week (L:T:P: S) (0:0:2:0)	Credits 1	SEE Marks	50
Total Hours of Pedagogy	-	Total Marks	100
Credits	1	Exam Hours	03
Course Objectives:			
<ol style="list-style-type: none"> 1. Introduce evolution of internet technology and need for IoT 2. Understand IoT architecture and various protocols and software. 3. Train the students to build IoT systems using sensors, single board computers and open source IoT platforms. 			
Note: Two hours tutorial is suggested for each laboratory sessions.			
Prerequisite			
<ol style="list-style-type: none"> 1. Familiarization with concept of IOT, Arduino/Raspberry pi and perform necessary software Installation. 2. Study of different operating systems for Arduino Understanding the process of OS installation on Arduino. 			
Sl. No.	List of problems for which student should develop program and Build a model in the Laboratory		
1	Aim: Introduction to fundamentals of IoT and Arduino Setting up an IoT laboratory requirements and Installation of an Arduino IDE.		
2	Aim: To know the Temperature and Humidity using DHT11 sensor. Program: Write a code and build a model for Interfacing DHT11 Humidity & Temperature Sensor with Arduino.		
3	Write a code and build a model to Controlling LED with Push Button.		
4	Write a code and build a model to Interfacing Soil Moisture Sensor with Arduino		
5	Write a code and build a model to know How does a Water Level Sensor Work and How to Interface it with Arduino?		
6	Write a code and build a model to Interfacing RFID Reader With Arduino		
7	Write a code and build a model to How Does MQ-3 Alcohol Detector Work with Arduino and detect Alcohol?		
8	Write a code and build a model to Building your own Sun Tracking Solar Panel using an Arduino		
9	Write a code and build a model to MQ-5 Combustible Gas Sensor Interfacing with Arduino		
10	Create a small dashboard application to be deployed on cloud. Different publisher devices can publish their information and interested application can subscribe		
11	Write a server application to be deployed on Raspberry-Pi. Write client applications to get services from the server application		
12	Optional Understanding and connectivity of Raspberry-Pi with a Zigbee module. Write a network application for communication between two devices using Zigbee		

Assessment Details (both CIE and SEE)

Component		Weightage (%)	
CIE's	CIE 1 8 th week	10	20
	CIE 2 14 th week	10	
Lab Records		30	
Continuous Internal Evaluation Total Marks: 50			
Semester End Examination (SEE) Total Marks: 50			

Course Outcome (Course Skill Set)

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

CO1: Analyze IOT architectural components.

CO2: Interfacing Sensor and Actuator with Arduino development board.

CO3: Describe protocols of resource constraint network.

CO4: Compare and contrast the deployment of smart objects and the technologies to connect them to network.

CO5: Design and develop IOT applications.

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 course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

Each experiment to be evaluated for conduction with observation sheet and record write-up.

- Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
The suitable rubrics can be designed to evaluate each student's performance and learning ability. Rubrics suggested in Annexure-II of Regulation book
- The average of 02 tests is scaled down to 20 marks (40% of the maximum marks).
- The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course is 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answerscript to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- Students can pick one experiment from the questions lot of PART A with equal choice to all the students in a batch. For PART B examiners should frame a question for each batch, student should develop an algorithm, program, execute and demonstrate the results with appropriate output for the given problem.
- Weightage of marks for PART A is 80% and for PART B is 20%. General rubrics suggested to be followed for part A and part B.
- Change of experiment is allowed only once and Marks allotted to the procedure part to be made zero (Not allowed for Part B).
- The duration of SEE is 03 hours
- Rubrics suggested in Annexure-II of Regulation book

Text Books:

- 1) "Internet of Things (A Hands-on-Approach)" by Vijay Madiseti and Arshdeep Bahga, 1st Edition, VPT, 2014. ISBN 13: 9780996025515
- 2) Srinivasa K G, "Internet of Things", CENGAGE Learning India, 2017 ISBN: 9789386858955
- 3) David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IOT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)

Reference Books:

- 1) Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014. (ISBN: 978-8173719547)
- 2) Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)
- 3) "The Internet of Things – Key applications and Protocols" by Olivier Hersent, David Boswarthick, Omar Elloumi, , Wiley, 2012 ISBN: 978-1-119-99435-0

E-resources

- 1) www.coursera.org/specializations/IOT
- 2) www.futurelearn.com/courses/internet-of-things

CO- PO Mapping :

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	-	-	-	3	-	-	-	-	-	-	3	3	2
CO2	3	3	3	3	3	2	-	-	3	3	1	3	3	2
CO3	3	3	3	3	3	2	-	-	3	3	1	3	3	2
CO4	3	3	3	3	3	2	-	-	3	3	1	3	3	2
CO5	3	3	3	3	3	2	-	-	3	3	1	3	3	2
Avg	3	3	3	3	3	2	-	-	3	3	1	3	3	2

RESEARCH METHODOLOGY AND IPR

Course Code	21IST56	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	02	Exam Hours	03

Prerequisites: Literature survey, Requirement analysis

Course objectives:

1. To give an overview of the research methodology and explain the technique of defining a research problem
2. To explain the functions of the literature review in research.
3. To explain carrying out a literature search, its review, developing theoretical and conceptual frame works and writing a review and research reports.
4. To explain various forms of the intellectual property, its relevance and business impact in the changing global business environment.
5. To discuss leading International Instruments concerning Intellectual Property Rights.

Teaching-Learning Process (General Instructions)

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

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop design thinking skills such as the ability to design evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module – I

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, An Illustration. (Text Book 1 - Chapter 1, 2)

08 Hours

Module – II

Reviewing the literature: Place of the literature review in research, bringing clarity and focus to research problem, improving research methodology, broadening knowledge base in research area, enabling contextual findings, Review of the literature, searching the existing literature, reviewing the selected literature, developing a theoretical framework, developing a conceptual framework, writing about the literature reviewed. (Text Book 4 - Chapter 3.)

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs. (Text Book 1 - Chapter 3.)

08 Hours

Module – III	
<p>Data Collection: Introduction, Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.(Text Book 1 - Chapter 6.)</p> <p>Ethics in Engineering Research- Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship. (Text Book 2 - Chapter 5.)</p> <p style="text-align: right;">08 Hours</p>	
Module – IV	
<p>Interpretation and Report Writing- Meaning of Interpretation, Techniques of Interpretation, Precautions 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, Conclusion.(Text Book 1 - Chapter 19.)</p> <p>Technical Writing and Publishing - Free Writing and Mining for Ideas, Attributes and Reasons of Technical Writing, Patent or Technical Paper —The Choice, Writing Strategies, Journal Paper:Structure and Approach, Language Skills, Writing Style, and Editing, Rules of Mathematical Writing, Publish Articles to Get Cited, or Perish. (Text Book 2 - Chapter 6.)</p> <p>Communicating Research Work: Presentation Skills - Oral Presentations - Language Choices, Delivery, Poster Presentations, and Presentation Preparation Guidelines. (Text Book 2 - Chapter 9.)</p> <p style="text-align: right;">08 Hours</p>	
Module – V	
<p>Intellectual property: an introduction - Intellectual property types, More patent basics. (Text Book 3 - Module 1 - 1, 2.)</p> <p>Patents- Detailed overview of patents-what is a patent, what can be the subject of a patent, Why are patents important. Legal requirements for patentability - Novelty, Inventive step/non obviousness, Industrial application/utility, Patentable subject matter, Disclosure requirement.(Text Book 3 - Module 2 - 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 2.5)</p> <p>Patent application preparation - Preparing patent applications - Obtaining invention disclosures from Inventors, identifying patentable inventions, Understanding the invention (core inventive concept), Inventor ship. Typical parts of the patent Application - Request, Description, Claims, Drawings, Abstract, and Application format.(Text Book 3 - Module 3 - 1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6).</p> <p style="text-align: right;">08 Hours</p>	
Teaching-Learning Process for all modules	Chalk and board, Active Learning, PPT Based presentation, Video
<p>Course Outcomes (Course Skill Set) At the end of the course the student will be able to: CO1. Explain the meaning of engineering research. CO2. Explore the procedure of Literature Review and Technical Reading. CO3. Explain the fundamentals of patent laws and drafting procedure. CO4. Explore the copyright laws and subject matters of copyrights and designs CO5. Comprehend the basic principles of design rights.</p>	

Assessment Details (both CIE and SEE)

Component		Weightage (%)	
CIE's	CIE 1 5 th week	20	60
	CIE 2 10 th week	20	
	CIE 3 15 th week	20	
AAT's	AAT-1 10 th week	10	
	AAT-2	10	
	AAT-3	20	
Continuous Internal Evaluation Total Marks: 100. Reduced to 50Marks			
Semester End Examination (SEE) Total Marks: 100. Reduced to 50Marks			

Textbooks

1	Research Methodology: Methods and Techniques	C. R. Kothari, Gaurav Garg	New Age International	4 th Edition, 2019
2	Engineering Research Methodology: A Practical Insight for Researchers	Dipankar Deb, Rajeeb Dey, Valentina E. Balas	Intelligent Systems Reference Library	1 st Edition, 2019
3	WIPO (2022), WIPO Patent Drafting Manual, 2nd edition. Geneva: WIPO.	DOI: 10.34667/tind.44657 ISBN: 978-92-805-3264-7	World Intellectual Property Organization	2 nd Edition, 2022
4	RESEARCH METHODOLOGY a step-by-step guide for beginners.	Ranjit Kumar	SAGE Publications India Pvt Ltd.	3 rd Edition, 2011

Reference Books

1	"Research Methods for Engineers"	David V. Thiel	Cambridge University Press	2020
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Online Resources

- https://onlinecourses.nptel.ac.in/noc22_ge08/preview
- <https://archive.nptel.ac.in/courses/127/106/127106227/>
- https://onlinecourses.swayam2.ac.in/cec20_hs17/preview
- <https://archive.nptel.ac.in/courses/110/105/110105139/>

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	1	-	2	1	2	2	2	2
CO2	3	3	2	2	-	-	-	1	-	3	2	2	2	1	3
CO3	3	3	3	3	2	1	1	-	2	2	2	2	3	3	3
CO4	2	3	3	2	-	1	1	-	2	2	-	3	3	3	-
CO5	2	3	3	2	-	-	-	2	-	3	1	2	3	3	2
AVG	2.6	3	2.8	2.4	2	1	1	1.3	2	2.4	1.4	2.2	2.6	2.4	2.5

ENVIRONMENTAL STUDIES						
Course Code	L-T-P-S (Hrs/week)	Credits	CIE Marks	SEE Marks	SEE Duration	Total Lecture Hours
21ENV57	1-0-0-0	1	50	50	3 hours	15
Course Objectives: To recognize major concepts in environmental sciences and demonstrate in-depth understanding of the environment. The industrial revolution and development have led to the stress on environment in the form of pollution. Checking of the pollution in all fronts at local and global level encompassing the issues of carbon credit, ozone level depletion, global warming, desertification and polar ice cap melting. The main objectives of the course is to expose to students to the problems and mitigation measures concerned to the environmental components like resources, air, water and land.						
Syllabus						
Module 1:						
Ecosystems (Structure and Function): Forest, Desert, Wetlands, Riverine, Oceanic and Lake. Biodiversity: Types, Value; Hot-spots; Threats and Conservation of biodiversity, Forest Wealth, and Deforestation. 3 Hours						
Module 2:						
Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind. Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable Mining, Cloud Seeding, and Carbon Trading. 3 Hours						
Module 3:						
Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution. Waste Management & Public Health Aspects: Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge. 3 Hours						
Module 4:						
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. 3 Hours						
Module 5:						
Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications): G.I.S. & Remote Sensing, Environment Impact Assessment, Environmental Management Systems, ISO14001; Environmental Stewardship- NGOs. Field work: Visit to an Environmental Engineering Laboratory or Green Building; Visit to a local area to document environment assets river / forest / grassland / hill / mountain. Visit to a local polluted site-urban/rural/industrial/agricultural/Water Treatment Plant/ Waste water treatment Plant. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hills lopes; etc (field work equal to 2 lecture works) ought to be Followed by understanding of process and its brief documentation. 3 Hours						
Course outcomes: At the end of the course, students will be able to : <ul style="list-style-type: none"> • CO1: Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale, . • CO2: Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment. • CO3: Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components. • CO4: Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues. 						

Assessment Details (both CIE and SEE)

Component		Weightage (%)	
CIE's	CIE 1 5 th week	20	60
	CIE 2 10 th week	20	
	CIE 3 15 th week	20	
AAT's	AAT-1 10 th week	10	
	AAT-2	10	
	AAT-3	20	
Continuous Internal Evaluation Total Marks: 100. Reduced to 50Marks			
Semester End Examination (SEE) Total Marks: 100. Reduced to 50Marks			

Text Books:

- Benny Joseph: "Environmental Studies". Tata Mc Graw – Hill, 2nd Edition, 2012.
- S M Prakash: "Environmental Studies", Pristine Publishing House, Mangalore, 3rd Edition, 2018.
- R Rajagopalan: "Environmental Studies – From Crisis to Cure: Oxford Publisher, 2005.

Reference Books:

- Raman Sivakumar: "Principals of Environmental Science and Engineering", Cengage learning, Singapur, 2nd Edition, 2005.
- M.Ayi Reddy Textbook of environmental science and Technology, BS publications 2007.
- Dr. B.S Chauhan, Environmental studies, university of science press 1st edition.

E-Resources

<https://youtu.be/tqgo6PYfJLk?si=dd82TkdFKTu8D-zB>

CO-PO Mapping

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	-	-	-	-	-	3		1	-	-	-	2
CO2	-	-	-	-	-	2		1	-	-	-	2
CO3	-	-	-	-	-	3		1	-	-	-	2
CO4	-	-	-	-	-	3		1	-	-	-	2

C# & .Net Programming

Course Code	21ISL581	CIEMarks	50
Teaching Hours/Week(L:T:P:S)	3:0:0:0	SEEMarks	50
Total Hours of Pedagogy	40	TotalMarks	100
Credits	03	ExamHours	03

OBJECTIVES: The main Objective of this course is student know about windows, Web and Console Applications.

Teaching-Learning Process(General Instructions)

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

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/ logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss shows every concept can be applied to the real world-and when that's possible, it helps improve the student's understanding.

EXPERIMENT 1 – BASIC C# PROGRAMS

To understand about basics of C# and execute simple c# programs to perform the following actions:

- (a) Calculate Hypotenuse of triangle using dynamic initialization of variables
- (b) To get input from the user and perform calculations
- (c) Calculate the quadrant for the coordinates using if..else...ladder
- (d) Check whether the alphabet is a vowel or not using switch..case...
- (e) To understand about for. each loop and strings

EXPERIMENT 2 – CLASSES & OBJECTS

To develop a C# application to print the students list using classes and objects

EXPERIMENT 3 – INHERITANCE

To develop a C# application to implement inheritance concepts

- (a) Single Inheritance (b) Multilevel Inheritance (c) Multiple Inheritance

EXPERIMENT 4 – OPERATOR OVERLOADING

To develop a console application to implement operator overloading concept in C#

- (a) Unary Operator Overloading (b) Binary Operator Overloading

EXPERIMENT 5 – THREADING

AIM To develop a C# console application to implement threading concepts

EXPERIMENT 6 – DELEGATES & EVENTS

AIM To develop a c# console application to implement the following concepts:

(a) Delegates (b) Events

EXPERIMENT 7 – WINDOWS FORM CONTROL

To design a window-based application using C# code in VB.Net

EXPERIMENT 8 – VALIDATING DATA

To implement validating data entered in controls using

(a) Windows based application – Manual coding for validation

(b) Web based application – Validation Controls

EXPERIMENT 9 – CUSTOM DIALOG BOX & MDI APPLICATION

To design a notepad application to implement menus, custom dialog box and MDI concepts

EXPERIMENT 10 – RETRIEVING DATA FROM DATABASE & WORKING WITH DISCONNECTED ENVIRONMENT

To design windows-based application to retrieve data from SQL database and to work with disconnected environment in ADO.Net using C#

Assessment Details (both CIE and SEE)

Component		Weightage (%)	
CIE's	Lab Test1 8 th week	15	30
	Lab Test2 14 th week	15	
AAT's	Lab Record	20	
Continuous Internal Evaluation Total Marks: Reduced to 30Marks			
Semester End Examination(SEE) Total Marks: Reduced to 20Marks			

CO PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	2	-	-	-	-	-	-	-	-	-	-	2	-	3
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	1
CO3	2	2	3	3	2	-	-	-	-	1	2	-	2	-	3
CO4	3	2	2	2	-	-	2	2	2	3	2	-	2	-	2

WEB DESIGNING USING PHP AND MYSQL			
Course Code	21ISL582	CIE Marks	50
Teaching Hours / Week (L: T: P: S) (0:0:2:0)	Credits (0:0:1:0)	SEE Marks	50
Total Hours of Pedagogy	10 lab assignments	Total Marks	100
Credits	01	Exam Hours	03
Prerequisite: Web Development Basics - HTML, CSS, JavaScript			
Course objectives: <ol style="list-style-type: none"> 1. Understanding the basic concepts of PHP and its applications. 2. Understanding Cookies and Sessions. 3. Understanding MySQL database commands and queries. 4. Designing interactive web applications using PHP and MySQL. 5. Developing applications to solve real world problems. 			
Module-1			
Introduction to PHP: PHP features, XAMPP & WAMP, Installation of XAMPP, Basic PHP Syntax, Output Statements- print, echo, Adding comments in PHP. PHP Variables and Operators: Declaring Variables, Operators in PHP. Conditional and Looping Statements: If...Statement, Switch, For, For each, While, Do while.			
Assignments: <ol style="list-style-type: none"> 1. Write a program to check student grade based on the marks using if-else statement. 			
Conditions: <ul style="list-style-type: none"> • If marks are 60% or more, grade will be First Division. • If marks between 45% to 59%, grade will be Second Division. • If marks between 33% to 44%, grade will be Third Division. • If marks are less than 33%, student will be Fail. 			
08 Hours			
Module-2			
Functions: User defined functions, Function with Default Arguments, Passing Argument by Reference, Passing Argument by Value, Variable Scope, Built-in functions. Strings: Strings in PHP, String functions in PHP. Arrays: Types of arrays in PHP, Creation of arrays, Array functions.			
Assignments: <ol style="list-style-type: none"> 2. Write a PHP program to display a digital clock which displays the current time of the server. 3. Write a simple calculator program in PHP using switch case 			
Description: You need to write a simple calculator program in PHP using switch case.			
Operations: 1. Addition 2. Subtraction 3. Multiplication 4. Division			
08 Hours			

Module-3

File Handling: File opening modes, File Open/Read, File Create/Write, Delete a File. **Pattern Matching:** String pattern matching using regular expressions. **PHP Form Handling:** Input Form Creation, GET and POST Methods, include () and require ().

Assignments:

4. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.

08 Hours

Module-4

Cookies and Sessions: Cookies, PHP support for cookies. Starting a PHP Session, Storing and Accessing Session Data, Destroying Session Data.

MySQL: Introduction, Database creation, CREATE, ALTER, DELETE, DROP tables, INSERT, UPDATE, DELETE table data, WHERE clause AND, OR, IN, LIKE, DISTINCT, ORDER BY, GROUP BY, UNION Sub-queries LEFT JOIN, RIGHT JOIN, INNER JOIN.

Assignments:

5. Write a PHP program named states.py that declares variable states with value "Mississippi Alabama Texas Massachusetts Kansas". write a PHP program that does the following:
 - a. Search for a word in variable states that ends in xas. Store this word in element0 of a list named states List.
 - b. Search for a word in states that begins with k and ends in s. Perform a case-insensitive comparison. [Note: Passing re.Ias a second parameter to method compile performs a case-insensitive comparison.] Store this word in element1 of states List.
 - c. Search for a word in states that begins with M and ends in s. Store this word in element 2 of the list.
 - d. Search for a word in states that ends in a. Store this word in element 3 of the list.

08 Hours

Module 5

Database Programming PHP & MySQL: PHP MySQL functions, Connecting database.

Assignments:

6. Write a PHP program to sort the student records which are stored in the database using selection sort.

08 Hours

Using the knowledge from the above programs prepare a mini project and demonstrate.

Assessment Details (both CIE and SEE)

Component		Weightage (%)	
CIE's	Lab Test1 8 th week	15	30
	Lab Test2 14 th week	15	
AAT's	Lab Record	20	
Continuous Internal Evaluation Total Marks: Reduced to 30Marks			
Semester End Examination(SEE) Total Marks: Reduced to 20Marks			

Text Books:

1. Programming the World Wide Web, Robert W. Sebesta, Pearson Education, 8th Edition, 2014.

Reference Book:

1. Internet & World Wide Web How to program, M. Deitel, P.J.Deitel, A. B. Goldberg, Pearson Education / PHI, 3rd Edition, 2004.
2. Web Programming Building Internet Applications, Chris Bates, Wiley India.

Course Outcomes:

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

- CO1.** Develop dynamic webpages using basic concepts of PHP.
CO2. Apply Cookies and Sessions to control user sessions
CO3. Demonstrate various MySQL database queries.
CO4. Develop small applications using PHP/MySQL.
CO5. Develop applications to solve real-world problems.

POs	CO-PO Mapping														
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	3
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	1
CO3	3	2	3	3	2	-	-	-	-	1	2	-	2	-	3
CO4	3	2	3	3	3	-	3	3	2	3	3	-	3	-	3
CO5	3	3	2	2	2	-	-	-	-	2	3	3	2	3	1

MICROCONTROLLER PROGRAMMING

Course Code	21ISL583	IA Marks	50
Number of Lecture Hours/Week	01	Exam Marks	50
Total Number of Lecture Hours	15	Exam Hours	03

CREDITS – 01

Course Learning Objectives: This course 21ISL583 will enable students to

1. Develop and test Assembly Language Program (ALP) using ARM7TDMI/LPC2148.
2. Conduct the experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.

Module – 1

Introduction: Microprocessors versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software.

03 Hours

Module – 2

ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions.

03 Hours

Module – 3

Introduction to the ARM Instruction Set: Data Processing Instructions, Programme Instructions, Software Interrupt Instructions

03 Hours

Module – 4

Program Status Register Instructions, Coprocessor Instructions, Loading Constants, ARM programming using Assembly language

03 Hours

Module – 5

Writing Assembly code, Profiling and cycle counting, instruction scheduling, Register Allocation, Conditional Execution, Looping Constructs

03 Hours

Assessment Details (both CIE and SEE)

Component		Weightage (%)	
CIE's	Lab Test1 8 th week	15	30
	Lab Test2 14 th week	15	
AAT's	Lab Record	20	
Continuous Internal Evaluation Total Marks: 50 Marks			
Semester End Examination(SEE) Total Marks: 50 Marks			

Course Outcomes: After studying this course, students will be able to

1. Differentiate between Microprocessor and Microcontroller.
2. Write and test Assembly Language Program (ALP) using ARM7TDMI/LPC2148
3. Conduct the experiments on an ARM7TDMI/LPC2148 evaluation board using Embedded 'C' & Keil-U vision-4 tool/compiler.
4. Design and develop small scale embedded systems.
5. Understand about instruction set and Architecture of 8051

Text Books:

1. “The 8051 Microcontroller and Embedded Systems – using assembly and C”, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006.
2. “The 8051 Microcontroller”, Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.

Reference Books:

1. “The 8051 Microcontroller Based Embedded Systems”, Manish K Patel, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.
2. “Microcontrollers: Architecture, Programming, Interfacing and System Design”, Raj Kamal, Pearson Education, 2005.

The following Assembly Language Program (ALP) need to be executed using ARM7TDMI/LPC2148 using an evaluation board/simulator and the required software tool.

1. Write an ALP to Multiply two 16-bit binary numbers.
2. Write an ALP to find the sum of even/odd numbers from a given array of N numbers.
3. Write an ALP to check a given number is a prime number.
4. Write an ALP to add an array of 16-bit numbers and store the 32-bit result in internal RAM.
5. Write an ALP to transfer block of N numbers from internal memory to external memory and vice-versa.
6. Write an ALP to find the square of a number (1 to 10) using look-up table.
7. Write an ALP to find the largest/smallest number in an array of 32 numbers.
8. Write an ALP to arrange a series of 32-bit numbers in ascending/descending order.
9. Write an ALP to count the number of ones and zeros in two consecutive memory locations.
10. Write an ALP to search for a given key element using Binary Search algorithm.

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	3	2	2	-	-	-	-	-	-	-	-	2	2	2
CO2	3	2	1	2	-	-	-	-	-	-	-	-	2	2	3
CO3	1	2	2	3	-	-	-	-	-	-	-	-	2	2	2
CO4	1	1	3	1	-	-	-	-	-	-	-	-	2	3	2
CO5	3	2	2	2	-	-	-	-	-	-	-	-	3	2	2



Nagarjuna College of Engineering & Technology, Bengaluru

An Autonomous Institute, Affiliated to VTU Belagavi

**Scheme & Syllabus
of
VII Semester ISE**

Information Science & Engineering

w.e.f.

Academic Year 2023-2024

VISION

To disseminate the IT knowledge among the students for achieving excellence in education and to irradiate budding engineers as leaders in information technology.

MISSION

M1: To maintain leadership and excellence in Information Technology.

M2: Achieving excellence in IT through analysis, design, development of software products

M3: Developing communication skills, leadership qualities and team work among students' community by providing opportunities to work on various projects through internship with industry partners

M4: To inculcate Ethics and Human values for solving societal problems and environmental protection.

M5: Promoting research, higher studies and entrepreneurship among the students through outside world interaction

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates of Information Science and Engineering are expected to fulfil the following PEOs after a few years of their graduation.

PEO1: Pursue a successful career in the field of Information Science & Engineering or a related field utilizing his/her education and contribute to the profession as an excellent employee, or as an entrepreneur.

PEO2: Be able to work effectively in multidisciplinary environments and be responsible members/leaders of their communities

PEO3: The graduates of Information Science and Engineering Program should be able to establish an understanding of professionalism, teamwork, ethics, public policy that allows them to become good professional Engineers

PEO4: The graduates of Information Science and Engineering Program should be able to provide novel engineering solutions and efficient software designs with legal and ethical responsibility.

PEO5: Continuously improve by pursuing advanced degrees in engineering, business, or other professional fields through formal means or through informal self-study.

PROGRAM OUTCOMES (POs)

Graduates of the Information Science and Engineering Programme will be able to achieve the following POs:

PO1: Engineering Knowledge

Apply the knowledge of mathematics, science, engineering fundamentals, and Information Science and Engineering principles to the solution of complex problems in Information Science and Engineering.

PO2: Problem Analysis

Identify, formulate, research literature, and analyze complex Information Science and Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO3: Design/Development of Solutions

Design solutions for complex Information Science and Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of Complex problems

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions related to Information Science and Engineering problems.

PO5: Modern Tool Usage

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex Information Science and Engineering activities with an understanding of the limitations.

PO6: The Engineer and Society

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Information Science and Engineering practice.

PO7: Environment and Sustainability

Understand the impact of the professional **Information Science and Engineering** solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics

Apply ethical principles and commit to professional ethics and responsibilities and norms of the Information Science and Engineering practice.

PO9: Individual and Team work

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication

Communicate effectively on complex Information Science and Engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage Information Science and Engineering projects and in multidisciplinary environments.

PO12: Life Long Learning

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Program Specific Outcomes (PSOs) are what the graduates of a specific undergraduate engineering program should be able to do at the time of graduation.

PSO1: Professional Skills

The ability to understand, analyze and develop algorithms and write Information application programs in the areas related to information technology

PSO2: Problem-Solving Skills

Ability to understand the ethics, human values for solving societal problems and environmental protection

PSO3: Foundation of mathematical concepts

Ability to understand the software development skills and practical knowledge for promoting research, higher studies and entrepreneurship.

NCET Scheme and Syllabus VII Semesters 2023-24

Nagarjuna College of Engineering and Technology, Bengaluru
Scheme & Syllabus 2020-2021
Outcome-Based Education (OBE) and Choice-Based Credit System (CBCS)
Effective from the Academic year 2021-2022

VII Semester

Sl. No.	Course Code	Course Title	Teaching Department	Teaching Hours/Week				Examination			Credits	
				L	T	P	S	Duration in Hrs	CIE Marks	SEE Marks		Total Marks
1	20ISI71	Deep Learning (IC)	ISE	3	0	2	0	3	50	50	100	4
2	20ISI72	Cryptography & Network Security (IC)	ISE	3	0	2	0	3	50	50	100	4
3	20IST73X	Professional Elective – IV	ISE	3	0	0	0	3	50	50	100	3
4	20IST74X	Professional Elective – V	ISE	3	0	0	0	3	50	50	100	3
5	20IST75X	Industrial Elective – I	ISE	3	0	0	0	3	50	50	100	3
6	20ISP76	Project Phase – I	ISE	0	0	3	0	3	50	50	100	3
				15	0	5	0		300	300	600	20

Professional Elective – IV

Course Code	Course Name
20IST731	Software Testing & Quality Assurance
20IST732	Network Management
20IST733	Human Computer Interaction

Professional Elective – V

Course Code	Course Name
20IST741	UML & Agile Practices
20IST742	Natural Language Processing
20IST743	Software Architecture & Design Pattern

Industry Elective – I

Course Code	Course Name
20IST751	Cyber Security & Cyber Forensics
20IST752	Advanced Cloud Computing
20IST753	Precision Agriculture

DEEP LEARNING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20ISI71	3:0:2:0	4	CIE:50 SEE:50	3 Hours	PCC
Prerequisites: Data Mining, Data warehouse, Database, Big data, Cloud computing, Testing.					
Course Objectives: In this course, students will learn the fundamentals of deep learning, and the main research activities in this field. Moreover, students will learn to implement, train, and validate their own neural network, and they will improve their understanding of the on-going research in computer vision and multimedia field.					
Module I					
Machine Learning Machine Learning - Examples of machine learning applications - Types of machine learning – Supervised Learning: Classification - Decision Trees, Neural Networks – Unsupervised Learning: Clustering- Clustering Methods-Graph Clustering.					
Module II					
Fundamentals of Neural Networks Basics of Neural Networks- Neural network representation-History and Cognitive basis of neural computation- Perceptrons- Perceptron Learning Algorithm- Multilayer Perceptrons (MLPs) - Representation Power of MLPs - Back Propagation.					
Module III					
Deep Learning Fundamentals and Strategies Introduction to deep learning- History of Deep Learning- Perspectives and issues in deep learning – Deep Neural Networks - Unsupervised deep learning - Deep reinforcement learning - Deep learning strategies.					
Module IV					
CNN and RNN Foundations on CNN, Convolutional Neural Networks (CNNs): LeNet, AlexNet, ZF- Net, VGGNet, GoogLeNet, ResNet—Recurrent Neural Networks- Optimization in deep learning: Gradient Descent(GD)-Momentum Based GD.					
Module V					
Deep Learning Tools CUDA Tool Kit: Introduction, Programming Model, Programming interface, Performance Guidelines- NVIDIA- NVIDIA Architecture- Case Study : Tensor Flow, Caffe, Theano, Torch.					

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Course Outcomes:

Students undergoing this course are able to:

1. Discuss the concepts of machine learning algorithms.
2. Understand the fundamentals of neural networks.
3. Explain the different Strategies and Perspectives of Deep learning fundamentals.
4. Illustrate the concepts of CNN and RNN models.
5. Apply the knowledge in deep learning tools.

Text Books

1. Goodfellow, I., Bengio, Y., and Courville, A., ,Deep Learning', MIT Press, 2016.
2. Ethem Alpaydin, ,Introduction to Machine Learning', MIT Press, 2014.
3. Li Deng and Ding Yu, ,Deep Learning Methods and Applications', Now Publishers, 2014.

Reference Books

1. Tom M Mitchell, ,Machine Learning' , First Edition, McGraw Hill Education, 2013
2. Yegnanarayana, B, ,Artificial Neural Networks', PHI Learning Pvt. Ltd, 2009.
3. Satish Kumar, Neural Networks: A Classroom Approach', Tata McGraw-Hill Education, 2004.
4. Christopher Bishop, ,Pattern Recognition and Machine Learning' 2e, Springer, 2006.
5. Francois Chollet, "Deep learning with Python" – Manning Publications.

List of Exercises / Experiments

1. Basic image processing operations: Histogram equalization, thresholding, edge detection, data augmentation, morphological operations
2. Implement SVM/Softmax classifier for CIFAR-10 dataset: (i) using KNN, (ii) using 3 layer neural network
3. Study the effect of batch normalization and dropout in neural network classifier
4. Familiarization of image labelling tools for object detection, segmentation
5. Image segmentation using Mask RCNN, UNet, SegNet
6. Object detection with single-stage and two-stage detectors (Yolo, SSD, FRCNN, etc.)
7. Image Captioning with Vanilla RNNs
8. Image Captioning with LSTMs
9. Network Visualization: Saliency maps, Class Visualization
10. Generative Adversarial Networks
11. Chatbot using bi-directional LSTMs
12. Familiarization of cloud based computing like Google colab

CRYPTOGRAPHY & NETWORK SECURITY

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20ISI72	3:0:2:0	4	CIE:50 SEE:50	3 Hours	PCC
<p>Course Objectives: As a student will be able to learn:</p> <ul style="list-style-type: none"> ➤ Acquire the knowledge of basic concepts of cryptography and network security and classify attacks on a network. ➤ Understand and analyse the different process for hiding the information with conventional cryptographic algorithms. ➤ Comprehend various block cipher cryptosystems. ➤ Learn the concepts of public cryptosystems and key management Systems. ➤ Understand and apply authentication techniques to provide secure communication. 					
<p>Prerequisites: Students should have the knowledge of Computer Networks, Mathematics and Algorithm Concepts.</p>					
Syllabus					
Module – I					
<p>Introduction: Service mechanisms and attacks, The OSI security architecture, A Model for Network Security. Symmetric Ciphers: Symmetric cipher model, substitution techniques. 08 Hours</p>					
Module – II					
<p>Symmetric Ciphers: Transposition techniques, Steganography. Block Ciphers and DES: Simplified DES. Block cipher principles, DES, Strength of DES, Block cipher design principles. 08 Hours</p>					
Module – III					
<p>Advanced Encryption Standard - AES Transformation Function: Cipher-Substitute Bytes Transformation, Shift Row Transformation, Mix Column Transformation, Add Round Key Transformation, AES key expansion. Block cipher modes of operation. 08 Hours</p>					
Module – IV					
<p>Asymmetric Ciphers - Public key cryptography and RSA: Principles of public key cryptosystems, RSA algorithm. Other public key cryptosystems and key management: Key management, Diffie-Hellman key exchange. Elliptic Curve Cryptography. 08 Hours</p>					
Module – V					
<p>Network Security Applications - Authentication Applications: X.509 Authentication Service, Kerberos. Electronic Mail Security: PGP. 08 Hours</p>					

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LIST OF EXPERIMENTS	
1	Caesar Cipher: Implement a simple Caesar cipher encryption and decryption algorithm.
2	Public Key Cryptography: Introduce RSA encryption and decryption. Generate public and private keys and encrypt/decrypt messages.
3.	Establish a shared secret between two parties that can be used for secret communication to exchange data over a public network using Diffie-Hellman algorithm.
4.	Implement Simplified DES - Key Generation Simulation Program using C Programming
5.	Implement Hill program using c
6.	Secure Email Configure email clients for encrypted communication using PGP/GPG. Exchange encrypted emails.
<p>Course Outcomes: At the end of this course, students will be able to CO1: Describe the basic concepts of cryptography and network security and classify attacks on a network, symmetric ciphers and substitution techniques. CO2: Apply and integrate the different process for hiding the information with conventional cryptographic algorithms, transposition techniques and block ciphers. CO3: Illustrate the various block cipher cryptosystems like DES and AES. CO4: Analyze public cryptosystems and key management systems CO5: Demonstrate and analyze authentication techniques to provide secure communication.</p>	
<p>Textbooks: 1) Cryptography and Network Security: William Stallings, Pearson Education, 2003 2) Behrouz A Forouzan, Debdeep Mukhopadhyay: Cryptography and Network Security, 2nd Edition, Special Indian edition, Tata McGraw-Hill, 2011.</p>	
<p>Reference Books: 1) Cryptography and Network Security, Atul Kahate, TMH, 2003</p>	
<p>Reference Online Resources: 1) https://nptel.ac.in/course.php</p>	

NCET Scheme and Syllabus VII Semesters 2023-24

SOFTWARE TESTING AND QUALITY ASSURANCE

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST731	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PEC
<p>Course Objectives:</p> <ol style="list-style-type: none"> 1. Learn to apply the testing strategies and methodologies in projects. 2. To know test management strategies and tools for testing. 3. To know the awareness on the open problems in software testing and maintenance. 4. To explain quality assurance and various tools used in quality management. 5. To learn in detail about various quality assurance models and to understand the audit assessment procedures to achieve quality. 					
Syllabus:					
Module – I					
<p>Software Testing Basics: Testing as an engineering activity, Role of process in software quality, Testing as a process, Basic definitions, Software testing principles, The tester’s role in a software development organization, Origins of defects, Defect classes, The defect repository and test design, Defect examples, Developer / Tester support for developing a defect repository.</p> <p style="text-align: right;">08 Hours</p>					
Module – II					
<p>Testing Techniques And Levels Of Testing: Using White Box Approach to Test design - Static Testing Vs. Structural Testing, Code Functional Testing, Coverage and Control Flow Graphs, Using Black Box Approaches to Test Case Design, Random Testing, Requirements based testing, Decision tables, State-based testing, Cause-effect graphing, Error guessing, Compatibility testing, Levels of Testing -Unit Testing, Integration Testing, Defect Bash Elimination. System Testing - Usability and Accessibility Testing, Configuration Testing, Compatibility Testing.</p> <p style="text-align: right;">08 Hours</p>					
Module – III					
<p>Software Test Automation And Quality Metrics: Software Test Automation, Skills needed for Automation, Scope of Automation, Design and Architecture for Automation, Requirements for a Test Tool, Challenges in Automation Tracking the Bug, Debugging. Testing Software System Security - Six-Sigma, TQM - Complexity Metrics and Models, Quality Management Metrics, Availability Metrics, Defect Removal Effectiveness, FMEA, Quality Function Deployment, Taguchi Quality Loss Function, Cost of Quality</p> <p style="text-align: right;">08 Hours</p>					
Module – IV					
<p>Fundamentals Of Software Quality Assurance: SQA basics, Components of the Software Quality Assurance System, software quality in business context, planning for software quality assurance, product quality and process quality, software process models, 7 QC Tools and Modern Tools</p> <p style="text-align: right;">08 Hours</p>					

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Module – V	
Software Quality Assurance Models And Trends: Models for Quality Assurance, ISO-9000 series, CMM, CMMI, Test Maturity Models, SPICE, Malcolm Baldrige Model- P-CMM Software Process- PSP and TSP, OO Methodology, Clean-room software engineering, Defect Injection and prevention, Internal Auditing and Assessments, Inspections & Walkthroughs, Case Tools and their Affect on Software Quality.	08 Hours
Course Outcomes: By the end of the course, students should be able to	
<ol style="list-style-type: none">1. Applying testing techniques to deliver a product free from bugs.2. Evaluate the scenario and to select the proper testing technique.3. Explore the test automation concepts and tools and estimation of cost, schedule based on standard metrics.4. Understand how to detect, classify, prevent and remove defects.5. Identify the appropriate quality assurance models and develop quality.	
Textbooks:	
<ol style="list-style-type: none">1. Srinivasan Desikan, GopalaswamyRamesh, Software Testing: Principles and Practices Pearson.2. Daniel Galin, Software Quality Assurance: From Theory to Implementation, Pearson Addison Wesley	
Reference Books:	
<ol style="list-style-type: none">1. Aditya P. Mathur, Foundations of Software Testing, Pearson.2. Paul Ammann, Jeff Offutt, Introduction to Software Testing, Cambridge University Press.3. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, Auerbach Publications.4. William Perry, Effective Methods of Software Testing, Wiley Publishing, Third Edition.5. RenuRajani, Pradeep Oak, Software Testing – Effective Methods, Tools and Techniques, Tata McGraw Hill.6. Stephen Kan, Metrics and Models in Software Quality, Addison – Wesley, Second Edition.	
Reference Online Resources:	
<ol style="list-style-type: none">1. https://www.tutorialspoint.com/software_testing/software_testing_qa_qc_testing.htm.2. https://www.bmc.com/blogs/quality-assurance-software-testing/#.3. https://strongqa.com/qa-portal/knowledge-base/key-concepts/software-testing	

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NETWORK MANAGEMENT

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST732	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PEC
Module 1					
<p>Data communication and network management overview: Analogy of Telephone Network Management, Communications protocols and Standards, Case Histories of Networking and Management, Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions, Network and System Management, Network Management System Platform, Current Status and future of Network Management.</p>					
08 Hours					
Module 2					
<p>SNMPV1 Network Management Managed Network: Organization and Information Models Managed Network: Case Histories and Examples, The History of SNMP Management, The SNMP Model, The Organization Model, System Overview, The Information Model. SnmPV1 Network Management: Communication and Functional Models, The SNMP Communication Model, Functional model. SNMP Management: SNMPv2 Major Changes in SNMPv2, SNMPv2 System architecture, SNMPv2 Structure of Management Information, The SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility with SNMPv1.</p>					
08 Hours					
Module 3					
<p>SNMP Management: RMON : What is Remote Monitoring? ,RMON SMI and MIB, RMON1, RMON2, ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON Tele communications Management network: Why TMN? , Operations Systems, TMN Conceptual Model, TMN Standards, TMN Architecture, TMN Management Service Architecture, An Integrated View of TMN, Implementation Issues.</p>					
08 Hours					
Module 4					
<p>Network Management Tools And Systems: Network Management Tools, Network Statistics Measurement Systems, History of Enterprise Management, Network Management systems, Commercial Network management Systems, System Management, Enterprise Management Solutions.</p>					
08 Hours					
Module 5					
<p>Web-Based Management : NMS with Web Interface and Web-Based Management, Web Interface to SNMP Management, Embedded Web-Based Management, Desktop management Interface, Web-Based Enterprise Management, WBEM: Windows Management Instrumentation, Java management Extensions, Management of a Storage Area Network , Future Directions. Case Studies:</p>					
08 Hours					

NCET Scheme and Syllabus VII Semesters 2023-24

Course Outcomes :

After the completion of course, the student will able to

1. Acquire the knowledge about network management standards (OSI and TCP/IP)
2. Acquire the knowledge about various network management tools and the skill to use the min monitoring a network.
3. Analyse the challenges faced by Network managers
4. Evaluate various commercial network management systems and open network management systems.
Analyse and interpret

Text Book:

Mani Subrahmanian, "Network Management Principles and Practice", 2nd Edition, Pearson Education,2010.

References:

Morris, "Network management", 1stEdition, Pearson Education,2008.

Mark Burges, "Principles of Network System Administration", 1st Edition, Wiley DreamTech,2008.

HUMAN COMPUTER INTERACTION

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST733	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PEC
Course Objectives: <ul style="list-style-type: none"> To learn the foundations of Human Computer Interaction. To become familiar with the design technologies for individuals and persons with disabilities. To be aware of mobile HCI. To learn the guidelines for user interface. 					
Syllabus					
Module – I					
Foundations of HCI: The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. – Case Studies.					
					08 Hours
Module – II					
Design & Software Process: Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.					
					08 Hours
Module – III					
Models and Theories Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. – Case Studies.					
					08 Hours
Module – IV					
HCI in the Software Process HCI in the software process, The software life cycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction.					
					08 Hours
Module – V					
Web Interface Design Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow – Case Studies.					
					08 Hours

NCET Scheme and Syllabus VII Semesters 2023-24

Course Outcomes:

- Upon completion of the course, the students should be able to:
- Design effective dialog for HCI
- Design effective HCI for individuals and persons with disabilities.
- Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- Develop meaningful user interface.

Textbooks:

- Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, —Human Computer Interaction, 3rd Edition, Pearson Education, 2004 (UNIT I, II, III & IV)
- Bill Scott and Theresa Neil, —Designing Web Interfaces, First Edition, O'Reilly, 2009. (UNIT-V)

Reference Books:

- Mobile Design and Development, Brian Fling, First Edition, O'Reilly Media Inc., 2009
- The essential guide to user interface design, Wilbert O Galitz, Wiley DreamaTech.
- Designing the user interface. 3rd Edition Ben Shneidermann , Pearson Education Asia.

NCET Scheme and Syllabus VII Semesters 2023-24

UML & AGILE PRACTICES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST741	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PEC
Course Objectives:					
<p>This course will enable students to:</p> <ul style="list-style-type: none"> • Understand the basic concepts of Object Orientation and UML. • Get a clear understanding of how to use UML and design diagrams. • Comprehend an iterative; incremental development process leads to faster delivery of more useful software. • Apply the principles and practices of extreme programming. • Analyse the essence of agile development methods and develop prototyping in the software process. 					
Syllabus					
Module – I					
<p>UML Diagrams: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history. UML diagrams – Use Case – Class Diagrams– Interaction Diagrams – State Diagrams – Activity Diagrams – Package, component and Deployment Diagrams.</p>					
08 hours					
Module – II					
<p>Advanced Modeling And Design: System sequence diagrams - Relationship between sequence diagrams and use cases Logical architecture and UML package diagram – Logical architecture refinement - UML class diagrams derived data; Packages; State Modeling, Advanced: Events, States, Transitions and Conditions; State diagrams; State diagram behaviour, nested states signal generalization concurrency; Relation of class and state models.</p>					
08 hours					
Module – III					
<p>The Agile Movement-A Five Minute Primer, What is Agile Development? The Agile Methodologies Agile Values, Agile Practices, Agile Principles. Agile Characteristics-The Characteristics of an Agile Project, The Development Team Project Management, The Customer, Processes and Tools The Contract, What Projects Can Benefit from Agile Development?</p>					
08hours					
Module – IV					
<p>The Agile Methodologies: Extreme Programming, Scrum, Crystal family of methodologies, Feature Driven Development, Adaptive Software Development, Dynamic Systems Development Method, Lean Software Development. Selecting an Approach that Fits: Choosing between an Agile or Traditional Approach.</p>					
08hours					
Module – V					
<p>Scrum Practices: Scrum Master, product Backlog, Scrum teams, Scrum meetings, Sprint Planning meeting, Sprint.</p>					
08 hours					

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Course Outcomes

On completion of this course, the students will be able to:

CO1: Understand the basic concepts of object orientation analyse and design object oriented system using UML.

CO2: Use the advanced UML analysis and design diagrams.

CO3: Comprehend the common characteristics of an agile development process.

CO4: Analyse and contrast agile software development process models and plan driven process models.

CO5: Determine software project characteristics that would be suitable for an agile process.

Text Books:

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2005. (module 1 and 2)
2. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005. (module 1 and 2)
3. Ken Schwaber And Mike Beedle, Agile Software Development With Scrum, Pearson Education, 2015. ISBN-13:9780132074896 (Module 5)
4. Peter Schuh, Integrating Agile Development In The Real World (Charles River Media Programming), 2004 Cengage Learning, ISBN-13:9781584503644
5. Agile software development methods, Review and analysis By Pekka Abrahamsson, Outi Salo & Jussi Ronkainen (VTT Electronics, Juhani Warsta, University of Oulu)

Reference Books:

1. Simon Bennett, Steve Mc Robb and Ray Farmer, "Object Oriented Systems Analysis and Design Using UML", Fourth Edition, Mc-Graw Hill Education, 2010.
2. Alistair Cockburn, Agile Software Development: The Cooperative Game, Pearson Education, 2015. ISBN-13:9780321482754
3. Mike Cohn, Succeeding With Agile : Software Development Using Scrum, Pearson Education Limited, 2016, ISBN-13:9789332547964

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NATURAL LANGUAGE PROCESSING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST742	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PEC
Course Contents:					
Module I					
<p>Introduction: Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms; Language, Thought, and Understanding; The State of the Art and The Near Term Future; Regular Expressions and Automata; Morphology and Finite-State Transducers: Lexicon-free FSTs: The Porter Stemmer, Human Morphological Processing.</p>					
8 Hours					
Module II					
<p>N-grams: Counting Words in Corpora, Smoothing, N-grams for Spelling and Pronunciation, Entropy; Word Classes and Part-of-Speech Tagging: Part-of-Speech Tagging , Rule-based Part-of-speech Tagging, Stochastic Part-of-speech Tagging, Transformation-Based Tagging; Context-Free Grammars for English: Constituency, Context-Free Rules and Trees, Sentence Level Constructions, The Noun Phrase.</p>					
8 Hours					
Module III					
<p>Parsing with Context-Free Grammars: The Early Algorithm; Features and Unification: Feature Structures, Unification of Feature Structures, Features Structures in the Grammar, Implementing Unification, Parsing with Unification Constraints; Lexicalized and Probabilistic Parsing: Probabilistic Context-Free Grammars, Problems with PCFGs.</p>					
8 Hours					
Module IV					
<p>Representing Meaning: First Order Predicate Calculus, Some Linguistically Relevant Concepts, Related Representational Approaches, Alternative Approaches to Meaning; Semantic Analysis : Syntax-Driven Semantic Analysis, Attachments for a Fragment of English; Lexical Semantics : Relations Among Lexemes and Their Senses, Word Net: A Database of Lexical Relations, The Internal Structure of Words.</p>					
8 Hours					
Module V					
<p>Discourse: Reference Resolution, Text Coherence, Discourse Structure; Generation: Introduction to Language Generation, An Architecture for Generation; Machine Translation: Language Similarities and Differences, The Transfer Metaphor.</p>					
8 Hours					
Course Outcomes (COs):					
<p>CO1: At the end of the course, the students should be able to: 1. Interpret how speech and language technology relies on formal models to capture knowledge, and language processing deals with subparts of words (morphology). (PO1,5,11, PSO-2)</p>					
<p>CO2: Illustrate the way N-gram tool is used for spelling and pronunciation processing, and part-of-speech tagging mechanism using various categories. (PO-2,3, 11, PSO-2)</p>					
<p>CO3: Describe feature structures and unification operation which is used to combine them, and probabilistic parsing to capture more syntactic information. (PO-2,11, PSO-2)</p>					
<p>CO4: Outline representations used to bridge the gap from language to common sense Knowledge (semantic processing), and meanings associated with lexical items. (PO1,3,5,11, PSO-2)</p>					
<p>CO5: Emphasize problems that NLP systems face, natural language outputs construction from non-linguistic inputs and machine translation framework approaches. (PO-1,11, PSO-2)</p>					

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Text Book:

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition, 2008.

Reference Book:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

SYSTEM ARCHITECTURE & DESIGN PATTERNS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST743	3:0:0:0	3	CIE:50 SEE:50	3 Hours	PEC
Course Objectives:					
<p>This course is designed to understand design patterns and their underlying objects oriented concepts.</p> <ul style="list-style-type: none"> ➤ Learn the day-to-day problems faced by object-oriented designers and how design patterns solve them ➤ Provide an interface for creating families of related objects without specifying their concrete classes. ➤ To know the consequences of combining patterns on the overall quality of a system. 					
Module I					
Introduction to Design Patterns					
<p>Design Pattern Definition, Design Patterns in Small Talk MVC, Describing Design Patterns, Catalog of Design Patterns, Organizing the Catalog, Solving of Design Problems using Design Patterns, Selection of a Design Pattern, Use of Design Patterns.</p> <p style="text-align: right;">8 Hours</p>					
Module II					
Designing a Document Editor: A Case Study					
<p>Design problems, Document structure, Formatting, Embellishing the User Interface, Supporting Multiple Look and Feel standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation. Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.</p> <p style="text-align: right;">8 Hours</p>					
Module III					
Structural Patterns-1: Adapter, Bridge, Composite.					
Structural Patterns-2: Decorator, Facade, Flyweight, Proxy, Discuss of Structural Patterns.					
8 Hours					
Module IV					
Behavioral Patterns-1: Chain of Responsibility, Command, Interpreter, Iterator. Behavioral Patterns-2: Mediator, Memento, Observer.					
8 Hours					
Module V					
Behavioral Patterns-2(cont'd): State, Strategy, Template Method, Visitor, and Discussion of Behavioral Patterns. What to Expect from Design Patterns, a Brief History. The Pattern Community An Invitation, A Parting Thought.					
8 Hours					

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Course Outcomes:

Upon completion of the course, the students should be able to:

- CO1:** Develop own way of working with design patterns. (L6).
- CO2:** Critique well-known design patterns (L5).
- CO3:** Distinguish different categories of design patterns (L4).
- CO4:** Apply common design patterns to incremental/iterative development (L3).
- CO5:** Identify appropriate patterns for solving a given problem (L3).

Text Book:

1. Erich Gamma, "Design Patterns", Pearson Education.

Reference Books:

1. Mark Grand, "Pattern's in JAVA" , Vol-I, WileyDreamTech.
2. Mark Grand, "Pattern's in JAVA", Vol-II By, WileyDreamTech.
3. Mark Grand, "JAVA Enterprise Design Patterns", Vol-III, WileyDreamTech.
4. Buschmann & others, "Pattern Oriented Software Architecture", John Wiley & Sons.

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CYBER SECURITY AND CYBER FORENSIC

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST751	3:0:0:0	3	CIE:50 SEE:50	3 Hours	IEC
Course Objectives:					
This course will enable students to,					
<ul style="list-style-type: none"> ➤ Understand the fundamental concepts of cyber security and Information security. ➤ Identify cyber security risks and take risk preventive steps. ➤ Identify the cyber vulnerability issues and cyber hacking Techniques. ➤ Analyse cybercrime scenario sand learn to investigate by collecting the evidence. 					
Syllabus					
Module–I					
Cyber Security: Network and Security Concepts, Information Assurance Fundamentals, Basic Cryptography, Symmetric Encryption, Public Key Encryption, the Domain Name System (DNS), Firewalls, Virtualization, Radio-Frequency Identification.					
08Hours					
Module– II					
Cyber Vulnerability: Scanning Overview of vulnerability scanning, Open Port / Service Identification,Banner/VersionCheck,TrafficProbe,VulnerabilityProbe,VulnerabilityExamples,OpenV AS,Metasploit. Networks Vulnerability Scanning - Netcat, Socat, Network Reconnaissance – Nmap, Network Sniffers and Injection tools– Tcp dump and Wireshark, H ping Kismet.					
08Hours					
Module – III					
Cyber Ethical Hacking: Introduction, Foot printing, and Reconnaissance - Scanning Networks – Enumeration –System Hacking –Malware Threats–Sniffing. Attacker Techniques and Motivations:Anti-forensics,FraudTechniques,code,ThreatInfrastructure.MaliciousCode:Self-ReplicatingMaliciousCode,StealingInformationandExploitation,FormGrabbing, Man-in-the-Middle Attacks, DLL Injection, Browser Helper Objects.					
08 Hours					
Module – IV					
Cyber Crime: Introduction to Cyber Crime and law Cyber Crimes, Types of Cybercrime, Hacking, Attackvectors,CyberspaceandCriminalBehavior,ClarificationofTerms,TraditionalProblemsAssociated with ComputerCrime,IntroductiontoIncidentResponse,DigitalForensics,ComputerLanguage,NetworkLangu age,Realms of the Cyber world.					
08Hours					
Module – V					
Cyber Forensics: Introduction to Cyber Crime Investigation Firewalls and Packet Filters, password Cracking, Key loggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks.					
08Hours					

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Course Outcomes:

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

CO1: Define and illustrate Cyber Security concepts and their application.

CO2: Analyse the cyber vulnerabilities and techniques used by hackers to create frauds.

CO3: Analyse and compare various types of malicious code.

CO4: Illustrate appropriate techniques to solve cyber security threats.

CO5: Analyse and compare various types of cybercrime and its forensic investigations.

Textbooks:

- 1) James Graham, Richard Howard, Ryan Olson- CyberSecurity Essentials CRCPress, ISBN9780815351429, Published December14, 2010, by Auerbach Publications.
- 2) Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81-265-21791, PublishDate2013.

References

- 1) MarjieT.Britz-Computer Forensics and Cyber Crime: An Introduction–Pearson.
- 2) Kimberly Graves "Official Certified Ethical Hacker Review Guide", ISBN-13:978-0-7821-4437-6, Wiley Publishing, Inc. 2015.
- 3) Chwan-Hwa (John) Wu,J. David Irwin - Introduction to Computer Networks and Cyber security - CRCPress.

E-Resources:

- 1) <https://www.hacker101.com/>
- 2) <https://blog.elearnsecurity.com/free-resources-to-legally-practice-ethical-hacking.html>
- 3) <https://www.routledge.com/Cyber-Security-Essentials/Graham-Olson-Howard/p/book/9781439851234>
- 4) <https://doc.lagout.org/security/ceh-official-certified-ethical-hacker-review-guide-exam-312-50.9780782144376.27422.pdf>
- 5) <https://www.pdfdrive.com/ethical-hacking-and-penetration-testing-guide-e18776556.html>
- 6) https://heimdalsecurity.com/pdf/cyber_security_for_beginners_ebook.pdf

ADVANCED CLOUD COMPUTING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
20IST752	3:0:0:0	3	CIE:50 SEE:50	3 Hours	IEC
<p>Course Objectives: This course will enable students to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Identify the security and compliance benefits of by using the AWS Cloud. <input type="checkbox"/> Understand the access control and management features of AWS. <input type="checkbox"/> Learn about data encryption methods to secure all types of sensitive data. <input type="checkbox"/> Get knowledge about the important steps for managing various AWS resources. <input type="checkbox"/> Study the AWS services to protect network security. 					
Syllabus					
Module-I					
<p>Introduction to AWS: AWS history, features, AWS Global infrastructure, Comparing AWS to other cloud computing providers. An overview of the AWS API, AWS API security. Understanding the role of the AWS Management Console, creating an AWS account, Loading Data into S3 Buckets, S3 URL naming conventions.</p> <p style="text-align: right;">08 Hours</p>					
Module-II					
<p>AWS Storage services: AWS S3, AWS EBS, AWS S3 concepts, creating S3 bucket, AWS storage classes, AWS versioning, storage gateway, AWS snowball. AWS Identity Services: AWS IAM, features, IAM identities, IAM roles.</p> <p style="text-align: right;">08 Hours</p>					
Module-III					
<p>AWS computing and marketplace: AWS EC2, EC2 pricing options, AWS EBS, EC2 auto scaling, creating an EC2 instances, EBS volume types, AWS AMI, AWS load balancing, AWS Lambda, CloudWatch EC2, AWS Route53.</p> <p style="text-align: right;">08 Hours</p>					
Module-IV					
<p>AWS Networking and database services: AWS VPC, architecture of VPC, VPC peering, direct connect, Architecture of direct connect, features of direct connect, Relational Database, Non-relational Database, AWS elasticache, Aws DynamoDB, AWS Aurora, AWS redshift.</p> <p style="text-align: right;">08 Hours</p>					
Module-V					
<p>AWS Application Services: AWS SQS, AWS SWF, AWS SNS, Elastic Transcoder, API Gateway, AWS kinesis. AWS Monitoring and Analytics: AWS CloudWatch, Cloud trail, AWS trustedAdviser. AWS pricing and support: AWS pricing models, Billing dashboard, consolidation billing, AWS budgets, AWS cost Explorer, AWS support plans.</p> <p style="text-align: right;">08 Hours</p>					
<p>Course Outcomes On completion of this course, the students will be able to:</p> <p>CO1: Discuss system virtualization and outline its role in enabling the cloud computing</p>					

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system model.

CO2: Illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS.

CO3: Design various management and other distinguish services of AWS.

CO4: Develop security and compliances for AWS.

CO5: Analyze the billing of resources and other paradigm: how to deal with disasters.

Text Books:

1) Barrie Sosinsky. John Wiley & Sons. Cloud Computing Bible.. First Edition January 2011. ISBN-13: 978-0470903568.

2) Bernard Golden Amazon Web Services For Dummies. For Dummies publication; 1 edition (9 August 2013) ISBN-13: 978- 1118571835

3) Rajkumar Buyya, Cloud Computing: Principles and Paradigms, John Wiley & Sons, First Edition (3 January 2011). ISBN: 9780470887998

Reference Books:

1) Amazon.com Mashups by Francis Shanahan, Wrox, Wiley Publishing Inc., ISBN-13: 978-0470097779, ISBN-10: 0470097779

2) Amazon Web Services in Action by Michael Wittig and Andreas Wittig, Dreamtech Press, ISBN: 9789351198758

3) Building Applications in the Cloud: Concepts, Patterns and Projects by Christopher M. Moyer, Pearson Addison-Wesley Professional, ISBN-10: 0321720202, ISBN-13: 978-0321720207

4) Cloud Computing Design Patterns by Thomas Erl, Prentice Hall, ISBN-10: 0133858561, ISBN- 13: 978-0133858563

E-Resources

1) Amazon Security overview whitepaper- <https://aws.amazon.com/whitepapers>

2) IAM Getting started Guide

<http://docs.aws.amazon.com/IAM/latest/UserGuide/getting-started.html>

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PRECISION AGRICULTURE

Course Code	L : T : P	Credits	Exam Marks	Exam Duration	Course Type
20IST753	3:0:0:0	3	CIE:50 SEE:50	3 Hours	IEC
<p>Prerequisites: Basic Computer Knowledge Linear Algebra Statistics and Probability Calculus Graph Theory Programming Skills – Language such as Python, R, MATLAB, C ++ or Octave Data, Hardware.</p>					
<p>Course Objectives: This course will enable students to:</p> <ol style="list-style-type: none"> 1. Detailed description of latest tools and technologies available for the Agriculture 5.0. 2. Describe different type of hardware, platforms and techniques for use in smart farming. 3. Learn different modeling techniques in precision agriculture. 4. Make data driven based decision making & support systems. 5. Learn policies and regulations for adopting AI & ML techniques in Agriculture. 					
Syllabus					
Module I					
<p>Introduction to Precision Agriculture: History of Precision Agriculture and its Global, Precision Agriculture – Introduction, Need and Scope of Precision Agriculture, Components of Precision Agriculture, Tools and Techniques, Site-Specific Crop Management (SSCM, Variable Rate Application (VRA) and Variable Rate Technology (VRT, Adoption of Smart Precision Agriculture, Some Misconceptions about Precision Agriculture,</p> <p>Smart Intelligent Precision Agriculture: Modern Day Agriculture, Digitization of Agriculture-Digital Farming, Transition to Smart Intelligent Precision Agriculture, Benefits of Smart Intelligent Precision Agriculture.</p> <p style="text-align: right;">08 Hours</p>					
Module II					
<p>Adoption of Wireless Sensor Network (WSN) in Smart Precision Agriculture: Sensors and Wireless Sensor Network, Evolution of Wireless Sensor Networks, Introduction of WSN in Agriculture, Features of Agriculturally Based Sensors, Types of Sensors Used for WSN Agricultural System, Intelligent Sensors Versus Smart Sensors, Impact of the Wireless Sensors on Traditional Agriculture, Sensor Based Variable Rate Application,, Applications of WSN in Precision Agriculture, Security Issues and Challenges for WSN Implementation. IoT (Internet of Things) Based Agricultural Systems: Introduction, Architecture of IoT, Brief Overview of IoT Network, Characteristics of Internet of Things, Inter-Operability Challenges, Applications of IoT in Smart Agriculture, Challenges for the Implementation of IoT in Smart Farming, Security and Privacy Issues of an IoT, Fusion of Cloud Platform with IoT.</p> <p style="text-align: right;">08 Hours</p>					
Module III					
<p>AI (Artificial Intelligence) Driven Smart Agriculture: Artificial Intelligence (AI) – Introduction, Categories of AI, Subsets of AI,Life Cycle of an Artificial Intelligence-Based, Prerequisites for Building an ML/AI-Based Agricultural Model, Advantages of A.I in Agriculture.</p>					

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Machine Learning (ML) Driven Agriculture:

Cognitive Technologies, Introduction to Machine Learning, Types of ML, Artificial Neural Networks and Deep Learning, General Applications of Machine Learning, Scope of Artificial Intelligence and Machine Learning in Agriculture, Applications of A.I and M.L in Agriculture.

08 Hours

Module IV

Data-Driven Smart Farming:

Introduction, Collection and Management of Real-Time Agricultural Big Data, Transforming Field Data into Meaningful Insights, Processing and Predictive Analysis of Agricultural Data, Predictive Modeling.

Decision-Making and Decision-Support Systems:

Introduction, Intelligent Agricultural Decision Support Systems (ADSS), Features and Workings of an Intelligent Agricultural Decision Support System (ADSS), Intelligent Decision-Making using AI, ML, and IoT for Farmers.

08 Hours

Module V

Agriculture 5.0 – The Future:

Introduction to Agriculture 4.0, Nanotechnology and Smart Farming, Blockchain -Securing the Agriculture Value Chain, Edge-Fog Computing for Smart Farming, Role of Big Data in Agriculture, Transition to Agriculture.

Social and Economic Impacts:

Societal and Economic Impact of AI, ML, and IoT in Intelligent Precision Farming, Existence of Forums for Innovation and Commercialization of Intelligent Precision Farming Technology (IPFT).

Environmental Impact and Regulations:

Potential Impact on the Environment with Different IPFT, Policy Making and Governance.

08 Hours

Course Outcomes:

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

CO1: Describe about Artificial Intelligence in precision agriculture

CO2: Analyze the WSN and IoT based Agricultural systems

CO3: Design AI and ML Driven system for agriculture

CO4: Describe the key aspects of data driven and decision making & support systems.

CO5: Discuss AI, its current scope and limitations, and societal implications.

Text books:

1. Latief Ahmad and FirasathNabi: **Agriculture 5.0**, Artificial intelligence, IoT and machine learning, Taylor & Francis, 1st edition, 2021.
2. Rajesh Singh, Anita Gehlot, Mahesh Kumar Prajapat, Bhupendra Singh, **Artificial Intelligence In Agriculture**, 2021.

Reference books:

1. K.C. Ting, S. Panigrahi : **Artificial Intelligence for Biology and Agriculture**, 1998.
2. GurjitKaur, PradeepTomar : **Artificial Intelligence and IoT-Based Technologies for Sustainable Farming and Smart Agriculture**, 2019.