



COMPUTATIONAL MATHEMATICS I

(2021-Scheme; Effective from the Academic Year 2022 - 2023)

III SEMESTER

Course Code	21MAT301	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:1	SEE Marks	50
Total Hours of Pedagogy	50	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Applied Mathematics-I, Applied Mathematics-II

COURSE OBJECTIVES:

- Enable the students to use the concepts of Fourier series and transforms to solve engineering problems.
- Study the various Numerical methods of solving first order Differential Equations.
- Develop combinatorics skills and apply the concept of recurrence relation and generating functions.
- Apply the concepts of mathematical logic to real life problems.
- Study the basic concepts of relations and functions and apply them to combinatorial problems.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Fourier series: Periodic functions, Dirichlet's condition. Fourier series of periodic functions and arbitrary period. Half-range Fourier series. Practical harmonic analysis and applications.	14 Hours
Fourier transforms: Infinite Fourier transforms, Fourier sine, and cosine transforms. Inverse Fourier transforms. Application of Fourier transforms for Signals.	

MODULE - II

Numerical solution of ODEs of the first order and first degree: Taylor's series method, Modified Euler's method. Problems on Runge -Kutta method of fourth order, Milne's and Adam-Bash forth predictor corrector method.	6 Hours
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MODULE - III

Combinatorics: Counting Principle, Permutations and Combinations, Binomial Theorem, Recurrence relations, Generating functions. Applications of Combinatorics in Computer Network Security.	10 Hours
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MODULE - IV

Mathematical Logic: Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic, Logical Implication – Rules of Inference. Quantifiers- Definitions, Uses, and the Proofs of Theorems. Applications of Mathematical Logic in Artificial Intelligence.	10 Hours
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MODULE - V

Relations: Cartesian Products and Relations, Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Equivalence Relations and Partitions. Partial Orders – Hasse Diagrams, Lattices, Groups.

10 Hours

Functions: One-One, Onto Functions. The Pigeonhole Principle, Function Composition, and Inverse Functions. Applications of Relations and Functions in Database Management systems.

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

CO - ASSESSMENT MAPPING

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)		
I	II	III			
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage	
40%	30%	30%	100%	100%	
*M I			M I	M I	
M II	M II		M II	M II	
	M III		M III	M III	
		M IV	M IV	M IV	
		M V	M V	M V	

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

M - Module

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to -Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have TEN full questions from FIVE Modules

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2. There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
3. Each full question may have a maximum of four sub-questions covering all the topics under a module.
4. The students will have to answer FIVE full questions, selecting one full question from each module.

TEXT BOOKS:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. Ralph P Grimaldi: Discrete and Combinatorial Mathematics, 5th edition, Pearson Education. 2004

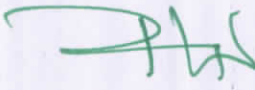
REFERENCE BOOKS:

1. C Ray Wylie, Louis C Barrett: "Advanced Engineering Mathematics", 6th Edition,
2. B.V Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill,
3. Thomas Koshy: Discrete Mathematics with Applications, Elsevier, 2005, Reprint 2008

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
2. <https://youtu.be/p2b2Vb-cYCs>
3. <https://youtu.be/O3U8fomrAug>
4. <https://youtu.be/UKHBWzoOKsY>
5. <https://youtu.be/spUNpyF58BY>
6. <https://youtu.be/X-z6elzZw80>




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DIGITAL LOGIC DESIGN AND COMPUTER ORGANIZATION

(2021-Scheme; Effective from the Academic Year 2022 - 2023)

III SEMESTER

Course Code	21CS32	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40L + 20P	Exam Hours	03

CREDITS – 4

COURSE PREREQUISITES:

- Basic logic design principles and various function of digital computer.

COURSE OBJECTIVES:

- Illustrate combinational digital circuits.
- Demonstrate the use of flipflops and apply for registers and counters.
- Explain the basic sub systems of a computer, their organization, structure and operation.
- Describe memory hierarchy and concept of cache memory.
- Describe arithmetic and logical operations with integer operands.
- Demonstrate different ways of communicating with I/O devices and standard I/O interfaces.
- Illustrate organization of a simple processor and other computing systems using instruction level parallelism.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Combinational Logic design: Karnaugh Map, Minimization of complete and incomplete Boolean expressions using K-Map, Multiplexers, Three state buffers, Decoders and Encoders, Programmable Logic devices.

(Text book 1:Part B: Chapter 5 (Sections 5.1 to 5.4),Chapter 9 (Sections 9.1 to 9.6))

8 Hours

MODULE - II

Sequential Logic Design: Flip-Flops and its Applications: Master Slave Flip-Flops, Edge-Triggered Flip-Flops, Registers, Counters, Design of Synchronous Counters.

Text book 1:Part B: Chapter 11 (Sections 11), Chapter 12(Sections 12)

8 Hours

MODULE - III

Basic Structure of Computers: Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement.

Memory System: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations.

Text book 2: Chapter1 – 1.3, 1.4, 1.6 (1.6.1-1.6.4, 1.6.7, Chapter5 – 5.1 to 5.4, 5.5 (5.5.1, 5.5.2), 5.6

8 Hours

MODULE - IV

Arithmetic: Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers.

8 Hours



Input/Output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Direct Memory Access, Buses, Interface Circuits.			
<i>Textbook 2: Chapter2-2.1, Chapter6 – 6.1 to 6.3 Chapter4 – 4.1, 4.2, 4.4, 4.5, 4.6</i>			
MODULE - V			
Basic Processing Unit: Some Fundamental Concepts, Execution of a Complete Instruction, Hard-wired Control, Micro programmed Control.			8 Hours
Machine Instructions and Addressing Modes: Memory Location and Addresses, Instructions and Instruction Sequencing, Addressing Modes			
<i>Textbook 2: Chapter7 – 7.1, 7.2,7.4, 7.5 Chapter2 – 2.2 to 2.5</i>			
LABORATORY COMPONENTS			
Exp. No.	Experiment Description	Bloom's Taxonomy Level	
1.	Design and implement Half adder, Half subtractor, Full adder and Full Subtractor using basic gates.	CL4	
2.	Given a 4-variable logic expression, simplify it using appropriate technique and realize the simplified logic expression using 8:1 multiplexer IC.	CL4	
3.	Design and implement code converter I) Binary to Gray (II) Gray to Binary Code.	CL4	
4.	Design and implement a mod-n ($n<8$) synchronous up counter using J-K Flip-Flop ICs and demonstrate its working.	CL4	
5.	Design and implement an asynchronous counter using decade counter IC to count up from 0 to n ($n\leq9$) and demonstrate on 7-segment display.	CL4	
6.	Synthesis of Combinational Multipliers to multiply two 4-bit binary numbers.	CL4	
7.	Design and simulate Booth's Multiplier to multiply two signed integers.	CL4	
8.	Design and realization of 16-bit ALU (Arithmetic Logic Unit).	CL4	
9.	Design and simulate 4x4 RAM.	CL4	
ASSESSMENT STRATEGY			
Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:			
Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Practical Session (Laboratory Component)	40 %	20
2	Semester End Examination (SEE)	100 %	50
CO - ASSESSMENT MAPPING			
Continuous Internal Assessment (CIA) (50%)			Semester End Exam (SEE) (50%)
Continuous Internal Evaluation (CIE) (60%)		Practical Sessions (40%)	
I	II		III
Syllabus Coverage			Syllabus Coverage
40%	30%	30%	100%
M I			M I
M II	M II		M II
	M III		M III
		M IV	M IV
		M V	M V



NOTE:

- Assessment will be both CIA and SEE.
- The practical sessions of the IPCC shall be for CIE only.
- The/Theory component of the IPCC shall be for both CIA and SEE respectively.
- The questions from the practical sessions shall be included in Theory SEE.

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer **FIVE** full questions, selecting one full question from each module.

TEXT BOOKS:

1. Charles H Roth and Larry L Kinney, Analog and Digital Electronics, Cengage Learning, 2019. (**Chapters: 5, 9, 11, 12**)
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition, Tata McGraw Hill, 2002 (**Chapters: 1, 2, 4, 5, 6, 7**)

REFERENCE BOOKS:

1. Digital Principles and Design, Donald D. Givone, 1st Edition, 2002, Tata McGraw-Hill Publishers.
2. Computer Organization and Architecture Designing For Performance, William Stallings 11th Edition, 2019, Pearson.
3. Logic and Computer Design Fundamentals, M. Morris Mano Charles Kime, 4th Edition 2014, Pearson.
4. David A. Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 2008
5. Digital Design and Computer Architecture, David M Harris, Sarah L Harris, 2nd Edition, 2013, Elsevier Morgan Kaufmann Publishers.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://nptel.ac.in/courses/108/105/108105132/>
2. <https://nptel.ac.in/courses/106/103/106103068/>
3. <https://nptel.ac.in/content/storage2/courses/106103068/pdf/coa.pdf>
4. <https://nptel.ac.in/courses/106/105/106105163/>
5. <https://nptel.ac.in/courses/106/106/106106092/>
6. <https://nptel.ac.in/courses/106/106/106106166/>
7. <http://www.nptelvideos.in/2012/11/computer-organization.html>
8. <http://vlabs.iitkgp.ac.in/coa/index.html>
9. <http://vlabs.iitkgp.ac.in/dec>




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OBJECT ORIENTED PROGRAMMING WITH JAVA

(2021 Scheme; Effective from the Academic Year 2022 - 2023)

III SEMESTER

Course Code	21CS33	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40L + 20P	Exam Hours	03

CREDITS – 4

COURSE PREREQUISITES:

- Fundamental knowledge of Programming.

COURSE OBJECTIVES:

- Learn fundamental Object-Oriented features of Java, classes, objects and its methods.
- Set up Java JDK environment to create, debug and run simple Java programs.
- Explore the concepts of Inheritance, Packages and Interfaces.
- Create Multi-threaded programs, Event handling mechanisms
- Demonstrate the usage of NodeJS and Java API

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

The Java Language: An overview of Java, Data types, Variables and Arrays, Operators and Control statements. A closer look at methods and classes. A closer look at methods and classes.

Introducing classes: Fundamentals of classes and objects, A closer look at methods and classes.

Textbook 1: Chapter 1 to Chapter 7

8 Hours

MODULE - II

Inheritance: Inheritance basics, Usage of Super and final keywords, Multilevel Inheritance, Constructors, Method overriding, Dynamic method dispatch, Abstract classes.

Packages and Interfaces: Packages, Access Protection, Interfaces.

Textbook 1: Chapter 8 to Chapter 9

8 Hours

MODULE - III

Exception Handling: Fundamentals, Exception types, Uncaught Exceptions, Usage of try, catch, throw, throws, and finally keywords. Nested try, Multiple catch clauses, Java's built-in exceptions, User defined exceptions.

Multithreaded Programming: The Java thread model, the main thread, thread creation, Thread priorities, Synchronization, Interthread communication, Deadlock, Suspending, Resuming, Stopping threads, Producer consumer problem.

8 Hours



Textbook 1: Chapter 10 to Chapter 11			
MODULE - IV			
Event Handling: AWT Fundamentals, The delegation event model, Event classes, Sources of events, Event listener interfaces, Adapter class, Inner classes. Introduction to Swings. Node JS : The JavaScript Revolution , Getting Started with Node , Using the Terminal, Editors, npm, A Simple Web Server with Node, Event-Driven Programming using NodeJS. Textbook 1: Chapter 22 Textbook 2 : Chapter 1-2			8 Hours
MODULE - V			
Java API – Overview, Object-Relational Mapping, Java Support for Persistence, Another Standard, The Java Persistence API, Entity, Entity Metadata, Annotations, XML, Configuration by Exception, Creating an Entity, Entity Manager, Obtaining an Entity Manager, Persisting an Entity Finding an Entity, Removing an Entity, Updating an Entity, Transactions, Queries, Putting It All Together, Packaging It Up. Textbook 3: Chapter 1-2			8 Hours
LABORATORY COMPONENTS			
Exp. No.	Experiment Description	Bloom's Taxonomy Level	
1.	Demonstration of the Java fundamentals	CL3	
2.	Demonstrating creation of Java classes, objects, constructors, declaration and initialization of variables.	CL3	
3.	Demonstrate the core object-oriented concept of Inheritance, polymorphism	CL3	
4.	Demonstration of packages.	CL3	
5.	Demonstration of Interface in Java	CL3	
6.	Demonstration of multi-threaded programming.	CL3	
7.	Demonstration of Exception handling in Java	CL3	
8.	Demonstration of Event handling and NodeJS in Java.	CL3	
9.	Demonstration of Java API.	CL3	
ASSESSMENT STRATEGY			
Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:			
Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Practical Session (Laboratory Component)	40 %	20
2	Semester End Examination (SEE)	100 %	50
CO - ASSESSMENT MAPPING			
Continuous Internal Assessment (CIA) (50%)			Semester End Exam (SEE) (50%)
Continuous Internal Evaluation (CIE) (60%)		Practical Sessions (40%)	
I	II		III
Syllabus Coverage			Syllabus Coverage
40%	30%	30%	100%
M I			M I
M II	M II		M II



	M III		M III	M III
		M IV	M IV	M IV
		M V	M V	M V

NOTE:

- Assessment will be both CIA and SEE.
- The practical sessions of the IPCC shall be for CIE only.
- The Theory component of the IPCC shall be for both CIA and SEE respectively.
- The questions from the practical sessions shall be included in Theory SEE.

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

SEE QUESTION PAPER PATTERN:

- The question paper will have TEN full questions from FIVE Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

TEXT BOOKS:

1. Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007. (Chapters 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 21, 22, 29, 30, 31)
2. Ethan Brown, Web Development with Node and Express :Leveraging the java development stack. Published by O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472, 2014
3. Mike Keith and Merrick Schincariol Foreword by Linda DeMichiel, JPA Specification Lead, [JAVA][Pro JPA 2 - Mastering the Java Persistence API, 2009,

REFERENCE BOOKS:

1. Sourav Sahay, Object Oriented Programming with C++, 2nd Ed, Oxford University Press, 2006
2. E Balagurusamy, Programming with Java, McGraw Hill, 6th Edition, 2019.
3. Mahesh Bhavne and Sunil Patekar, "Programming with Java", First Edition, Pearson Education, 2008, ISBN:9788131720806

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. https://onlinecourses.nptel.ac.in/noc22_cs102/
2. <https://www.geeksforgeeks.org>



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DATA STRUCTURES AND ITS APPLICATIONS

(Scheme-2021; Effective from the Academic Year 2022 - 2023)

III SEMESTER

Course Code	21CS34	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Knowledge of Mathematics and C Programming.

COURSE OBJECTIVES:

This course will enable students to:

- Explain the fundamental knowledge of various types of data structures and their applications essential for implementing solutions to problems.
- Illustrate representations and implementations of various linear and non-linear data structures such as Stack, Queues, linked list, Trees, Graphs and Hashing.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction to Data Structures: Classifications, Data structure Operations, Demonstration of Sparse Matrices with arrays, Strings: Operations and Pattern Matching Algorithms. **8 Hours**

Stack: Concepts and Operations, Array Representation of Stacks, Stacks using Dynamic Arrays.

Applications of Stack: Infix to Postfix Conversion, Evaluation of Postfix expression, Recursion: Ackermann function.

MODULE - II

Queues: Introduction to Queues, Array and Linked Representation of Queues, Operations on queues, Circular queues Operations, Circular queues using Dynamic arrays, Dequeues, Priority Queues. **8 Hours**

Applications of Queues: Job Scheduling.

MODULE - III

Linked List: Introduction to Linked Lists, Representation of linked lists in Memory, Dynamic Memory allocation functions, Singly Linked list Operations: Traversing, Searching, Insertion and Deletion, Header linked lists, Doubly Linked lists Operations, Circular linked lists, Linked Stacks and Queues. **8 Hours**

Applications of Linked Lists: Polynomials, Sparse matrix representation.

MODULE - IV

Trees: Terminologies, Binary Trees, Properties of Binary trees, Array and linked representation of Binary Trees, Binary Tree Traversals, threaded binary trees, Binary Search Trees: Definition, Insertion, Deletion, Traversal, Searching, AVL tree, B-Tree. **8 Hours**



Application of Trees: Evaluation of Arithmetic Expression.

MODULE - V

Graphs: Terminologies, Graph representations, Traversal methods: Breadth First Search and Depth First Search.

8 Hours

Hashing: Introduction, Hash Table organizations, Hashing Functions, Static and Dynamic Hashing

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

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1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

CO - ASSESSMENT MAPPING

Continuous Internal Assessment (CIA) (50%)			Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	
40%	30%	30%	100%	100%
M I			M I	M I
M II	M II		M II	M II
	M III		M III	M III
		M IV	M IV	M IV
		M V	M V	M V

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.



- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

TEXT BOOKS:

1. Ellis Horowitz and Sartaj Sahni, 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 and Forouzan, Data Structures : A Pseudo-code approach with C, 2nd Ed, Cengage Learning, 2014.
2. Jean Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013.
3. A M Tenenbaum, Data Structures using C, PHI, 1989.
4. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. https://www.youtube.com/watch?v=3Xo6P_V-qns&t=201s
2. <https://ds2-iiith.vlabs.ac.in/exp/selection-sort/index.html>
3. <https://nptel.ac.in/courses/106/102/106102064>
4. <https://ds1-iiith.vlabs.ac.in/exp/stacks-queues/index.html>
5. <https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html>
6. <https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html>



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DATA STRUCTURES LABORATORY WITH C

(2021-Scheme; Effective from the Academic Year 2022 - 2023)

III SEMESTER

Course Code	21CSL35	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	24P	Exam Hours	02

CREDITS – 1

COURSE PREREQUISITES:

- Basic Maths and Fundamentals of C Programming.
- Usage of IDEs like NetBeans

COURSE OBJECTIVES:

- To get practical experience in design, develop, implement, analyze and testing of various algorithms.
- To visualize and understand linear/nonlinear data structures with their applications such as Stack, Queues, Linked List, Trees, Graphs and Hashing.

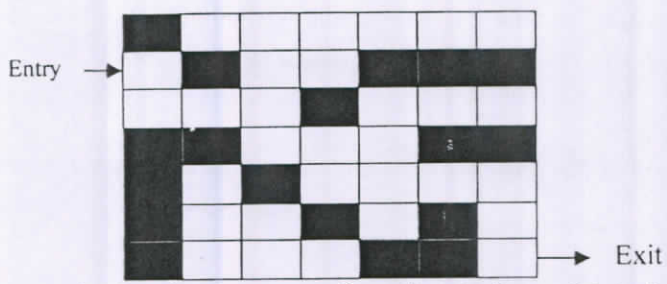
TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Demonstration
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

LIST OF EXPERIMENTS

Design, develop, and implement the specified algorithms using Python Programming under LINUX/Windows environment.

Exp. No.	Description
1	Design and Implement a program in C on Frequency Histogram, that builds a frequency array for data values in the range 1 to n and then prints their histogram. The program should, a. Read, Store and Print the data in an array. b. Analyze the data in the array, one element at a time. Add 1 to the corresponding element in a frequency array based on the data value. c. Print a histogram using asterisks for each occurrence of an element.
2	Design and Implement a program in C that simulates a mouse in a maze. The entrance spot, where the mouse starts its journey, is chosen by the user who runs the program. It can be changed each time. The sample maze is represented below,  The program must print the path taken by the mouse from the starting point to the final point, including all



	spots that have been visited and backtracked.																																								
3	Design and Implement a program in C for the following Stack Applications, a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^ b. Conversion of Arithmetic Expressions																																								
4	Design and Implement a program in C to categorize the data. Consider the following sample list of numbers, <table border="1"><tr><td>3</td><td>22</td><td>12</td><td>6</td><td>10</td><td>34</td><td>65</td><td>29</td><td>9</td><td>30</td><td>81</td><td>4</td><td>5</td><td>19</td><td>20</td><td>57</td><td>44</td><td>99</td></tr></table> Categorize and sort them into different groups as mentioned below: Group 1: Less than 10 Group 2: Between 10 and 19 Group 3: Between 20 and 29 Group 4: 30 and greater	3	22	12	6	10	34	65	29	9	30	81	4	5	19	20	57	44	99																						
3	22	12	6	10	34	65	29	9	30	81	4	5	19	20	57	44	99																								
5	Design and Implement a menu driven program in C for the following operations on Doubly Linked List (DLL) of Student Data with the fields: USN, Name, Dept, Marks, Ph. No. a. Create a DLL of N Students Data by using end insertion. b. Display the status of DLL and count the number of nodes in it c. Perform Insertion and Deletion at End of DLL d. Perform Insertion and Deletion at Front of DLL e. Display the total and average marks for each student																																								
6	Design and Implement a program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes, a. Represent and Evaluate a Polynomial $P(x, y, z) = 6x^2y^2z - 4yz^5 + 3x^3yz + 2xy^5z - 2xyz^3$. b. Find the sum of two polynomials POLY1(x, y, z) and POLY2 (x, y, z) and store the result in POLYSUM (x, y, z).																																								
7	Design and Implement a program in C that reads a list of names and telephone numbers to inserts them into a Binary Search Tree for the following operations, a. Search the list for a specified name. b. Insert a new name. c. Delete an existing name. d. Traverse the phone list using Inorder, Preorder and Postorder.																																								
8	A company has seven top officers working for it. They are each fluent in at least one language according to the following sample table, <table border="1"><thead><tr><th>Officer</th><th>Hindi</th><th>Malayalam</th><th>Kannada</th><th>Telugu</th></tr></thead><tbody><tr><td>01</td><td>-</td><td>-</td><td>Y</td><td>-</td></tr><tr><td>02</td><td>-</td><td>-</td><td>Y</td><td>Y</td></tr><tr><td>03</td><td>-</td><td>-</td><td>-</td><td>Y</td></tr><tr><td>04</td><td>-</td><td>Y</td><td>-</td><td>Y</td></tr><tr><td>05</td><td>Y</td><td>Y</td><td>-</td><td>-</td></tr><tr><td>06</td><td>Y</td><td>-</td><td>Y</td><td>-</td></tr><tr><td>07</td><td>-</td><td>Y</td><td>-</td><td>-</td></tr></tbody></table> Design and Implement a program in C for the following operations on Graphs (G), a. Create a graph using adjacency matrix indicating people who can communicate directly with each other. b. Print all the officers which are reachable from a given officer as a starting node in a digraph. Example: An officer wants to send a message to each other officer: A message comes to an officer; he reads it and transmits it to another officer possibly after translation to someone who has not read it.	Officer	Hindi	Malayalam	Kannada	Telugu	01	-	-	Y	-	02	-	-	Y	Y	03	-	-	-	Y	04	-	Y	-	Y	05	Y	Y	-	-	06	Y	-	Y	-	07	-	Y	-	-
Officer	Hindi	Malayalam	Kannada	Telugu																																					
01	-	-	Y	-																																					
02	-	-	Y	Y																																					
03	-	-	-	Y																																					
04	-	Y	-	Y																																					
05	Y	Y	-	-																																					
06	Y	-	Y	-																																					
07	-	Y	-	-																																					
9	Design and Implement a program in C that uses Hash Function $H:K \rightarrow L$ as $H(K)=K \bmod m$ (remainder method) and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.																																								

Note: Installation procedure of the required software must be demonstrated, carried out in groups and documented in the journal.



ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Laboratory Work (A)	50 %	25
	Laboratory Test (B)	30 %	15
	Open Ended Experiments /Mini Projects (C)	20 %	10
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT STRATEGY:

- I. In Laboratory Courses where (B) and (C) are not the components of the assessment pattern, then (A) will have 100% weightage (50 Marks).

Assessment Mode: Weekly Assessment of Laboratory Work (50 Marks) - the marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment, each of 25 marks) of the students in each laboratory session. The average of all the marks obtained across the sessions will be the Final CIA marks.

- II. In Laboratory Courses where (C) is not a component of the assessment pattern, then (A) will have 50% weightage (25 Marks), and (B) will have 50% weightage (25 Marks).

Assessment Mode: The marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment) (A) and One Laboratory Test (B).

- In Weekly Assessment, the student will be evaluated in each laboratory session for 25 marks. The average marks obtained across all the experiments will be the marks obtained for (A).
- A Laboratory Test, similar to the SEE exam is conducted towards the end of the Semester/Course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B)

The Sum of marks obtained across (A) and (B) will be the Final CIA marks.

- III. In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by considering the weightages given above, i.e. (A) – 25 Marks (Weekly Assessment), (B) – 15 Marks (Laboratory Examination), (C) – 10 marks (Open Ended Experiments/Mini Projects)

- The respective course instructor will design the assessment criteria for the said assessment components.
- The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.
- In all the cases, the assessments will be done based on the criteria designed by the Course Coordinator.

SEE QUESTION PAPER PATTERN:

1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.
2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

LEARNING RESOURCES

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.
2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw.
3. Gilberg & Forouzan, Data Structures: A Pseudo - Code Approach with C, 2nd Ed, Cengage Learning, 2014.
4. Michael J. Folk, Bill Zoellick and Greg Riccardi, "File Structures - An ObjectOriented Approach with C++", Pearson Education, 2004.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. https://www.youtube.com/watch?v=3Xo6P_V-qns&t=201s



2. <https://ds2-iiith.vlabs.ac.in/exp/selection-sort/index.html>
3. <https://nptel.ac.in/courses/106/102/106102064>
4. <https://ds1-iiith.vlabs.ac.in/exp/stacks-queues/index.html>
5. <https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html>
6. <https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html>
7. <https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/index.html>



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UHV -1: SOCIAL CONNECT & RESPONSIBILITIES

(2021- Scheme; Effective from the Academic Year 2022 - 2023)

III SEMESTER

Course Code	21UH36	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Exam Hours	01

CREDITS – 1

COURSE PREREQUISITES:

- Have/Develop the critical analysis of the day today happenings.

COURSE OBJECTIVES:

This course will enable students to:

- Enable the student to do a deep drive into societal challenges being addressed by NGO(s), social enterprises & The government and build solutions to alleviate these complex social problems through immersion, design & technology.
- Provide a formal platform for students to communicate and connect to their surroundings.
- Enable to create a responsible connection with society

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Connectivity with Nature: Importance of plantation of a tree - process and nurturing (suggested to plant or adopt) They will also make an excerpt either as a documentary or a photoblog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature.	3 Hours
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MODULE - II

Heritage walk and Regional Crafts: Know the Heritage place related to you (the history and culture), connecting to people around through their history, knowing the city and its craftsman, photoblog and documentary on evolution and practice of various craft forms.	3 Hours
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MODULE - III

Organic farming and waste management: Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus.	3 Hours
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MODULE - IV

Water Conservation: Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices.	3 Hours
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MODULE - V

Food Practices: City's culinary practices, food lore, and indigenous materials of the region used in cooking.	3 Hours
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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. A total of 14-20 hrs. engagement per semester is required for the 3rd semester of the B.E. /B.Tech. program. The students will be divided into 10 groups of 35 each. Each group will be handled by two faculty mentors. Faculty mentors will design the activities (particularly Jamming sessions open mic, and poetry) Faculty mentors has to design the evaluation system

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

CO - ASSESSMENT MAPPING

Continuous Internal Assessment (CIA) (50%)			Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
M I			M I	M I
M II	M II		M II	M II
	M III		M III	M III
		M IV	M IV	M IV
		M V	M V	M V

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment	50 %	10



	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- A Jamming session will be conducted at the end of the course for 50 marks
- Jamming session includes -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.
- Faculty mentor has to design the evaluation system for Jamming session

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://www.aicteindia.org/sites/default/files/Vol.%20II%20%20AICTE%20UG%20%20Curriculum.>



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ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

(2021-Scheme; Effective from the Academic Year 2022 - 2023)

III/IV SEMESTER

Course Code	21KSK37/47	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Exam Hours	01

CREDITS – 1

COURSE PREREQUISITES:

- Kannada Language & Kannada Literature

COURSE OBJECTIVES:

- To bring out the best talents in students, in terms of language skills.
- To increase students' abilities to use planning, drafting and editing in Kannada language to improve their work
- To enable students to write Kannada correctly and meaningfully, i.e. to write letters, applications.
- To give an ideology about Kannada Literature.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

ಘಟಕ - ೧ ಅರ್ಜಿಗಳು, ಪತ್ರಗಳು	03 Hours
೧. ಪತ್ರ ವ್ಯವಹಾರ - ಸರ್ಕಾರಿ ಪತ್ರಗಳು, ಆರೋಗ್ಯಕಾರಿ ಪತ್ರಗಳು ಮತ್ತು ವೈಯಕ್ತಿಕ ಪತ್ರಗಳು ೨. ಆಹ್ವಾನ ಪತ್ರಿಕೆ, ಜಾಹೀರಾತು, ಪತ್ರಿಕಾ ಪ್ರಕಟಣೆ ೩. ಅರ್ಜಿ ನಮೂನೆಗಳು	

MODULE - II

ಘಟಕ - ೨ ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯಭಾಗ	03 Hours
೧. ವಚನಗಳು: ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರ ದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ ೨. ಕೀರ್ತನೆಗಳು: ಅದರಿದೇವನು ಫಲ ಇದರಿದೇವನು ಫಲ - ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸಿದರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು ೩. ತತ್ವಪದಗಳು: ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು - ಶಿಶುನಾಳ ಶರೀಫರು	

MODULE - III

ಘಟಕ - ೩ ಆಧುನಿಕ ಕಾವ್ಯ ಭಾಗ	03 Hours
೧. ಡಿವಿಜಿ ಯವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು ೨. ಕುರುಡು ಕಾಂಚಾಣ : ದ. ರಾ. ಬೇಂದ್ರೆ ೩. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು	



MODULE - IV

ಘಟಕ - ೪ ಲೇಖನಗಳು

03 Hours

೧. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ.ಎನ್. ಮೂರ್ತಿರಾವ್
2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ - ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ

MODULE - V

ಘಟಕ - ೫ ಕಥೆಗಳು

03 Hours

೧. ಯುಗಾದಿ - ವಸುದೇಂದ್ರ
2. ಬೆಡ್ ನಂಬರ್ ಏಳು - ತ್ರಿವೇಣಿ

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

CO - ASSESSMENT MAPPING

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)		
I	II	III			
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage	
40%	30%	30%	100%	100%	
M I			M I	M I	
M II	M II		M II	M II	
	M III		M III	M III	
		M IV	M IV	M IV	
		M V	M V	M V	

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15



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11	Any other Innovative Assignments (CL4 and above)	50 %	10
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Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

1. The question paper will have **SEVENTY MCQ** questions of 1 Marks each and **SIX** main questions of 5 Marks each.
2. Main questions will be asked from all **FIVE** modules.

TEXT BOOKS:

1. ಡಾ. ಹಿ. ಚಿ. ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ - ೧. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ, ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ. 1st Edition, 2020
2. ಆಡಳಿತ ಕನ್ನಡ (ಪತ್ರಿಕೆ - ೧, ಬ್ಲಾಕ್ ೪) ಪ್ರಕಟಣೆ: ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಮೈಸೂರು, 1st Edition, 2015
3. ಕನ್ನಡ ಮನಸು - ಇಂಜಿನಿಯರಿಂಗ್ ಪ್ರಥಮ ಪದವಿ ತರಗತಿ ಕನ್ನಡ ಪಠ್ಯ, ಪ್ರಕಟಣೆ: ಪ್ರಸಾರಾಂಗ ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ, 5th Edition, 2018

REFERENCE BOOKS:

೧. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ - ಕನ್ನಡ ಸಾಹಿತ್ಯ ಅಕಾಡೆಮಿ, ೨೦೧೭
2. ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ - ರಂ. ಶ್ರೀ. ಮುಗಳ, ಉಷಾ ಸಾಹಿತ್ಯ, ಮೈಸೂರು
3. ಸಮಗ್ರ ವಚನ ಸಂಪುಟಗಳು - ಎಂ. ಎಂ. ಕಲಬುರ್ಗಿ, ಕನ್ನಡ ಮತ್ತು ಸಂಸ್ಕೃತಿ ನಿರ್ದೇಶನಾಲಯ, ಬೆಂಗಳೂರು.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. https://shashiexambooks.blogspot.com/2018/02/blog-post_20.html
2. <https://themindpalace.in/index.php/category/kannada/kannada-authors/>



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ಬಳಕೆ ಕನ್ನಡ

(2021- Scheme; Effective from the Academic Year 2022 - 2023)

III/IV SEMESTER

Course Code	21KBK37/47	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Exam Hours	01

CREDITS – 1

COURSE PREREQUISITES:

- Kannada Language & Kannada Literature

COURSE OBJECTIVES:

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

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction, Necessity of learning a local language. Methods to learn the Kannada language. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities Key to Transcription. Kannada letter writing practice.	03 Hours
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MODULE - II

Personal Pronouns, Possessive Forms, Interrogative words Possessive forms of nouns, dubitive question and Relative nouns Qualitative, Quantitative and Color Adjectives, Numerals. Predictive Forms, Locative Case	03 Hours
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MODULE - III

Dative Cases, and Numerals - Ordinal numerals and Plural markers Defective / Negative Verbs Tenses	03 Hours
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MODULE - IV

Permission, Commands, encouraging and Urging words (Imperative words and sentences) Helping Verbs “iru and iralla”, Corresponding Future and Negation Verbs. Comparative, Relationship, Identification and Negation Words.	03 Hours
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MODULE - V

Conversation: Introducing each other Telephone Conversation Conversation in Market Enquiry about College	03 Hours
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ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

CO - ASSESSMENT MAPPING

Continuous Internal Assessment (CIA) (50%)			Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
M I			M I	M I
M II	M II		M II	M II
	M III		M III	M III
		M IV	M IV	M IV
		M V	M V	M V

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **SEVENTY MCQ** questions of 1 Marks each and **SIX** main questions of 5 Marks each.
- Main questions will be asked from all **FIVE** modules.

TEXT BOOKS:

- ಬಳಕೆ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ; ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.
- ವ್ಯಾವಹಾರಿಕ ಕನ್ನಡ (ಪತ್ರಿಕೆ - ೧, ಬ್ಲಾಕ್ ೪) ಪ್ರಕಟಣೆ: ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಮೈಸೂರು.



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REFERENCE BOOKS:

1. Kannada Kali (ಕನ್ನಡ ಕಲಿ) – ಲಿಂಗದೇವರು ಹಳೆಮನೆ, A Text Book to Learn Kannada by Non – Kannadigas who come to study Diploma, Engineering and Health Sciences in Karnataka, ಪ್ರಕಟಣೆ: ಪ್ರಸಾರಾಂಗ ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
2. Spoken Kannada – ಮಾತಾಡುವ ಕನ್ನಡ, ಪ್ರಕಟಣೆ – ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ ಬೆಂಗಳೂರು.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://www.wikihow.com/Learn-Kannada>
2. <https://www.languageshome.com/English-Kannada.htm>
3. <https://www.alllanguageresources.com/kannada/>



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CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAWS

(2021- Scheme; Effective from the Academic Year 2022 - 2023)

SEMESTER – III/IV

Course Code	21CIP37/47	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	18	Exam Hours	01

CREDITS – 1

COURSE PREREQUISITES:

- Understanding of social science and civics

COURSE OBJECTIVES:

- To Assimilate and get familiarized with basic information about Indian Constitution and provide overall legal literacy to the young technocrats to manage complex societal issues in the present scenario
- To identify their individual roles and ethical responsibilities towards society.
- To understand engineering ethics & responsibilities, through the learning of these topics students will be able to understand human rights/values and its implications in their life.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction and Basic Information about making of Indian Constitution. The role of the Constituent assembly after partition of India. Modern Indian political Boundaries. Preamble of the constitution. Citizenship provisions. Fundamental rights and its enforcement. Fundamental Duties and its scope and significance in Nation building. Directive Principles of state policy and its present relevance in our society with examples.

8 Hours

MODULE - II

Union Executive, Union Legislature and Union Judiciary. State Executive, State Legislature, State Judiciary. Parliamentary Committees, Important Parliamentary Terminologies & Judicial Reviews

3 Hours

MODULE - III

Election Commission of India. Emergency Provisions such as national emergency, state emergency and financial emergency. Amendment Provisions to Constitution. Panchayat & Municipality/ urban local administration. Special Constitutional provisions for SC & ST, OBC.

2 Hours

MODULE - IV

Scope and Aims of Engineering & Professional Ethics. Business Ethics, Corporate Ethics, Personal Ethics. Engineering and Professionalism, Positive and Negative faces of Engineering Ethics. Code of Ethics as defined in the website of Institution of Engineers. Profession, Professionalism and Professional Responsibility. Clash of Ethics. Conflict of Interest.

2 Hours

Responsibilities in Engineering. Impediments to Responsibility. IPR (Intellectual Property Rights)



MODULE - V

Cyber Laws its objectives and functions. Types of Cyber Crimes. Internet censorship.

3 Hours

Enforcement agencies. Information Technology Act, 2000.

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

CO - ASSESSMENT MAPPING

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)		
I	II	III			
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage	
40%	30%	30%	100%	100%	
M I			M I	M I	
M II			M II	M II	
	M III		M III	M III	
	M IV		M IV	M IV	
		M V	M V	M V	
		M VI	M VI	M VI	

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have 50 MCQ questions.
- Each MCQ questions consisting of 1 mark.

TEXT BOOKS:



1. G.B. Reddy, Mohd. Suhaib: "Constitution Of India And Professional Ethics" I K International Publishing House Pvt. Ltd.
2. Dr. Jyothi Rattan: "Cyber Laws and Information Technology" Bharath Law House Pvt. Ltd.

REFERENCE BOOKS:

1. J.N. Pandey – "Constitutional Law of India", 49th Ed., 2012, Central Law Agency Publishing
2. M.V Pylee – "Constitution Of India", 5th Ed., Vikas Publishing House, New Delhi

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. https://www.youtube.com/watch?v=vq2Q1_v6TNU



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COMPETITIVE PROGRAMMING USING C++

(2021-Scheme; Effective from the Academic Year 2022 - 2023)

III SEMESTER

Course Code	21CSL381	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	24P	Exam Hours	02

CREDITS – 1

COURSE PREREQUISITES:

- Basics of C/C++ Programming.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Competitive Programming: Introduction, Programming Contests, Tips for Practicing.

4 Hours

Recap of C/C++: Review of language fundamentals, Standard libraries, programming examples.

MODULE - II

Programming Techniques: Language Features, Recursive Algorithms, Bit Manipulation.

4 Hours

Efficiency: Time Complexity, Algorithm Design examples, Code Optimization.

Sorting and Searching: Sorting Algorithms, Solving problems by Sorting, Binary Search.

MODULE - III

Data Structures: Dynamic Arrays, Set Structures and Experiments.

4 Hours

Dynamic Programming: Basic Concepts, Examples, Backtracking.

Graph Algorithms: Basics of Graphs, Graph Traversal, Shortest Paths, Directed Acyclic Graphs, Successor Graphs.

MODULE - IV

Tree Algorithms: Basic Techniques, Tree Structures, Minimum Spanning Trees, Tree Queries, Advanced Techniques.

4 Hours

Mathematical Study: Number Theory, Combinatorics, Matrices, Probability, Game Theory, Fourier Transform, Geometric Techniques, Sweep Line Algorithms.





MODULE - V

String Algorithms: Basic Concepts, String hashing, Z-Algorithms, Suffix Arrays, String Automata

4 Hours

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Laboratory Work (A)	50 %	25
	Laboratory Test (B)	30 %	15
	Open Ended Experiments /Mini Projects (C)	20 %	10
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT STRATEGY:

I. In Laboratory Courses where (B) and (C) are not the components of the assessment pattern, then (A) will have 100% weightage (50 Marks).

Assessment Mode: Weekly Assessment of Laboratory Work (50 Marks) - the marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment, each of 25 marks) of the students in each laboratory session. The average of all the marks obtained across the sessions will be the Final CIA marks.

II. In Laboratory Courses where (C) is not a component of the assessment pattern, then (A) will have 50% weightage (25 Marks), and (B) will have 50% weightage (25 Marks).

Assessment Mode: The marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment) (A) and One Laboratory Test (B).

- In Weekly Assessment, the student will be evaluated in each laboratory session for 25 marks. The average marks obtained across all the experiments will be the marks obtained for (A).
- A Laboratory Test, similar to the SEE exam is conducted towards the end of the Semester/Course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B)

The Sum of marks obtained across (A) and (B) will be the Final CIA marks.

III. In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by considering the weightages given above, i.e. (A) – 25 Marks (Weekly Assessment), (B) – 15 Marks (Laboratory Examination), (C) – 10 marks (Open Ended Experiments/Mini Projects)

- The respective course instructor will design the assessment criteria for the said assessment components.
- The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.
- In all the cases, the assessments will be done based on the criteria designed by the Course Coordinator.

SEE QUESTION PAPER PATTERN:

1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.
2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

TEXT BOOKS:

1. Guide to Competitive Programming - Learning and Improving Algorithms through Contests by Antti Laaksonen, Second Edition, Springer, 2020.
2. Programming Challenges - The Programming Contest Training Manual by Steven S Skiena, Miguel A. Revilla, 2013.





FUNDAMENTALS OF R PROGRAMMING

(2021-Scheme; Effective from the Academic Year 2022 - 2023)

III SEMESTER

Course Code	21CSL382	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	24P	Exam Hours	02

CREDITS – 1

COURSE PREREQUISITES:

- Basics of C/C++ Programming.

COURSE OBJECTIVES:

This course will enable students to:

- Explore and understand how R and R Studio interactive environment.
- To learn and practice programming techniques using R programming.
- Read Structured Data into R from various sources.
- Understand the different data Structures, data types in R.
- To develop small applications using R Programming

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

History and Overview of R , Basic Features of R, Design of the R System, Getting Started with R. Numeric, Arithmetic, Assignment, and Vectors: R for Basic Math, Arithmetic, Variables, Functions, Vectors, Expressions and assignments Logical expressions.	4 Hours
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MODULE - II

Matrices and Arrays: Defining a Matrix, Sub-setting, Matrix Operations, Conditions and Looping: if statements, looping with for, looping with while, vector-based programming.	4 Hours
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MODULE - III

Lists and Data Frames: Data Frames, Lists, Special values, the apply family.	4 Hours
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MODULE - IV

Functions: Calling functions, scoping, Arguments matching, writing functions: The function command, Arguments, specialized function.	4 Hours
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MODULE - V

String Algorithms: Basic Concepts, String hashing, Z-Algorithms, Suffix Arrays, String Automata	8 Hours
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ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50



	Laboratory Work (A)	50 %	25
	Laboratory Test (B)	30 %	15
	Open Ended Experiments /Mini Projects (C)	20 %	10
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT STRATEGY:

- I. In Laboratory Courses where (B) and (C) are not the components of the assessment pattern, then (A) will have 100% weightage (50 Marks).

Assessment Mode: Weekly Assessment of Laboratory Work (50 Marks) - the marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment, each of 25 marks) of the students in each laboratory session. The average of all the marks obtained across the sessions will be the Final CIA marks.

- II. In Laboratory Courses where (C) is not a component of the assessment pattern, then (A) will have 50% weightage (25 Marks), and (B) will have 50% weightage (25 Marks).

Assessment Mode: The marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment) (A) and One Laboratory Test (B).

- In Weekly Assessment, the student will be evaluated in each laboratory session for 25 marks. The average marks obtained across all the experiments will be the marks obtained for (A).
- A Laboratory Test, similar to the SEE exam is conducted towards the end of the Semester/Course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B)

The Sum of marks obtained across (A) and (B) will be the Final CIA marks.

- III. In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by considering the weightages given above, i.e. (A) – 25 Marks (Weekly Assessment), (B) – 15 Marks (Laboratory Examination), (C) – 10 marks (Open Ended Experiments/Mini Projects)

- The respective course instructor will design the assessment criteria for the said assessment components.
- The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.
- In all the cases, the assessments will be done based on the criteria designed by the Course Coordinator.

SEE QUESTION PAPER PATTERN:

1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.
2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

TEXT BOOKS:

1. Guide to Competitive Programming - Learning and Improving Algorithms through Contests by Antti Laaksonen, Second Edition, Springer, 2020.
2. Programming Challenges - The Programming Contest Training Manual by Steven S Skiena, Miguel A. Revilla, 2013.



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AUTOSAR

(2021-Scheme; Effective from the Academic Year 2022 - 2023)

III SEMESTER

Course Code	21CSL383	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	24P	Exam Hours	02

CREDITS – 1

COURSE PREREQUISITES:

- Basics of C/C++ Programming.

COURSE OBJECTIVES:

This course will enable students to:

- Understand AUTOSAR Classic architecture and deployment.
- Write basic AUTOSAR software.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Demonstration
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction to AUTOSAR, AUTOSAR Architecture, Need for AUTOSAR, Applications of AUTOSAR, Membership structure, Standards - ISO 26262, IEC 61508 for Automotive Electric/Electronic Systems. Introduction to ECU and CAN, COMASSO project, Alternatives to AUTOSAR - Automotive Grade Linux, GENIVI Alliance.	5 Hours
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MODULE - II

AUTOSAR Base Software-Overview of BSW, about AUTOSAR Classic Release R21-11, Concept of Virtual Functional Bus, Interfaces of AUTOSAR, Software Components, Demo of AUTOSAR base software.	5 Hours
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MODULE - III

AUTOSAR Port Interfaces, Compositions and Connectors - Introduction, Sender Receiver Interface, Client Server Interface, Port Interface, Compositions, Connectors	5 Hours
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MODULE - IV

AUTOSAR Runnables and Events; AUTOSAR Run Time Environment (RTE), RTE Interfaces, RTE scheduling, RTE generator	5 Hours
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MODULE - V

Application software summary, AUTOSAR methodology, Limitations of non AUTOSAR software, MCAL Layer development, ECU Abstraction Layer development; ARXML Configuration, Creating ARXML interfaces	4 Hours
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ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Laboratory Work (A)	50 %	25
	Laboratory Test (B)	30%	15
	Open Ended Experiments /Mini Projects (C)	20 %	10
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT STRATEGY:

- I. In Laboratory Courses where (B) and (C) are not the components of the assessment pattern, then (A) will have 100% weightage (50 Marks).

Assessment Mode: Weekly Assessment of Laboratory Work (50 Marks) - the marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment, each of 25 marks) of the students in each laboratory session. The average of all the marks obtained across the sessions will be the Final CIA marks.

- II. In Laboratory Courses where (C) is not a component of the assessment pattern, then (A) will have 50% weightage (25 Marks), and (B) will have 50% weightage (25 Marks).

Assessment Mode: The marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment) (A) and One Laboratory Test (B).

- o In Weekly Assessment, the student will be evaluated in each laboratory session for 25 marks. The average marks obtained across all the experiments will be the marks obtained for (A).

- o A Laboratory Test, similar to the SEE exam is conducted towards the end of the Semester/Course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B)

The Sum of marks obtained across (A) and (B) will be the Final CIA marks.

- III. In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by considering the weightages given above, i.e. (A) – 25 Marks (Weekly Assessment), (B) – 15 Marks (Laboratory Examination), (C) – 10 marks (Open Ended Experiments/Mini Projects)

- The respective course instructor will design the assessment criteria for the said assessment components.
- The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.
- In all the cases, the assessments will be done based on the criteria designed by the Course Coordinator.

SEE QUESTION PAPER PATTERN:

1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.
2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

Reference Web Links and Video Lectures (e – Resources):

1. <https://www.AUTOSAR.org/standards/>
2. <https://www.comasso.org/>
3. AUTOSAR Architecture (Learn from Scratch with Demo) - <https://www.udemy.com/course/AUTOSAR-architecture/>





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ADDITIONAL MATHEMATICS - I

(2021- Scheme; Effective from the Academic Year 2022 - 2023)

III SEMESTER

Course Code	21MATDIP31	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	2:0:0:1	SEE Marks	50
Total Hours of Pedagogy	25	Exam Hours	03

CREDITS – 0

COURSE PREREQUISITES:

- Basics of Differentiation and Integration

COURSE OBJECTIVES:

- Enable the students to use the concepts of Vector and Vector Differentiation
- Study the various methods Solving first order Linear Differential Equations.
- Understand the Basic Concept of Partial Differentiation

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Vector Algebra -Basic Properties, Dot product and Cross Product of two vectors, -Problems. Complex Numbers: Polar form, Amplitude and Modulus of a complex number. De-Moivre's theorem, Argand Diagram.	5 Hours
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MODULE - II

Differential calculus: Review of elementary differential calculus, nth derivative of elementary functions, Leibnitz Rule, Polar curves - the angle between the radius vector and tangent, Angle between Two curves, Pedal equations.	5 Hours
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MODULE - III

Differential Equations: Solving first order Linear differential equations using Variable separable method, Exact Differential Equations, Linear Differential Equations.	5 Hours
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MODULE - IV

Partial differentiation: Total derivatives- differentiation of composite functions. Euler's Theorem- Problems. Jacobians-simple problems.	5 Hours
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MODULE - V

Vector Differentiation: Scalar and vector fields. Gradient, directional derivative; curl and divergence- physical interpretation; solenoidal and irrotational vector fields-Illustrative problems	5 Hours
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ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

CO - ASSESSMENT MAPPING

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE)(50%)
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
M I			M I	M I
M II	M II		M II	M II
	M III		M III	M III
		M IV	M IV	M IV
		M V	M V	M V

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to -Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer **FIVE** full questions, selecting one full question from each module.



TEXT BOOKS:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.

REFERENCE BOOKS:

1. B.V Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill,
2. H.K.Dass and Er. Rajnish Verma: "Higher Engineering Mathematics" S.Chand Publication (2014).

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
2. <http://academicearth.org/>
3. <http://www.bookstreet.in>.
4. VTU e-Shikshana Program



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COMPUTATIONAL MATHEMATICS-II

(Effective from the Academic Year 2022 - 2023)

IV SEMESTER

Course Code	21MAT401	CIA Marks	50
Number of Contact Hours/Week (L:T:P:S)	3:0:0:1	SEE Marks	50
Total Hours of Pedagogy	50 L	Exam Hours	3 Hours

CREDITS – 3

COURSE PREREQUISITES:

Applied Mathematics-I, Applied Mathematics-II, Basics of Statistics and Complex Numbers

COURSE OBJECTIVES:

- Study the techniques of complex variables and functions together with their derivatives, Contour integration and transformations
- Enable the students to apply basic concepts of graph theory on developing algorithms
- Understand the concept of probability and enable the students to predict the outcome of simple experiments
- Enable the students to use various tests of significance in engineering problems
- Understand the concept of optimization techniques

TEACHING - LEARNING STRATEGY:

These are some sample strategies, which course faculty members can incorporate in the Teaching Learning Process:

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses

COURSE CONTENTS

MODULE - I

Calculus of Complex functions & Construction of Analytic functions: Review of a function of a complex variable, limits, continuity, differentiability. **10 Hours**

Analytic functions: Cauchy-Riemann equations in Cartesian and polar forms. Properties and construction of analytic functions.

Construction of analytic functions: Milne-Thompson Method. Application of analytic functions.

Text book 3: Chapter 20:(sections 20.2 to 20.6)

MODULE - II

Introduction to Graph Theory: Definitions and Examples, Subgraphs, Complements, Coloring, Matching. **10 Hours**

Trees: Definitions, Properties- Examples, Routed Trees, Trees and Sorting, Weighted Trees, and Prefix Codes.

Textbook2-Chapter 11(11.1,11.2,11.6), Chapter 12(12.1,12.2,12.3,12.4), Chapter13(13.4)





MODULE - III

Probability Distribution Functions: Random variables (discrete and continuous), probability mass/density functions, Binomial, Poisson distributions-problems. Exponential and Normal distributions-problems, Joint Probability distribution for two discrete random variables, expectation and covariance, Markov chain.

10 Hours

Text Book 1: Chapter 21:(sections 21.51, 21.52,21.55 to 21.61)

MODULE - IV

Curve Fitting & Statistical Methods: Correlation-Karl Pearson's coefficient of correlation regression analysis-lines of regression.

10 Hours

Curve Fitting: Curve fitting by the method of least squares- fitting the curves of the form $y = ax + b$, $y = ax^b$, and $y = ax^2 + bx + c$.

Optimization Techniques: Graphical method and Simplex Method. Application in optimization problems.

Text Book 1: Chapter 21:(sections 21.51, 21.52,21.55 to 21.61)

MODULE - 5

Sampling and Testing Hypothesis: Null hypothesis, Alternate hypothesis, Type-I & II error, -Only Definitions.

10 Hours

Test of significance for small samples: student's t-distribution, Chi-square distribution as a test of goodness of fit. **Test of significance for large samples** – Test of hypothesis for proportions and means, Probable limits for proportions. Application in finding the insight of the sample.

Text Book 1: Chapter 21 :(Sections: 21.65, 21.68 ,21.75,21.73,21.77 to 21.80 ,21.82)

COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Construct analytical functions to solve problems in electromagnetic field theory	CL3
CO2	Utilize basic concepts of Graph theory to develop algorithms of prefix codes.	CL3
CO3	Illustrate Discrete and Continuous random variables and Probability distribution functions to analyse the probability models in engineering field	CL3
CO4	Validate hypothesis testing and apply the Principles of Sampling to infer the nature of population	CL3
CO5	Solve LPP and use correlation and regression analysis to fit a Mathematical model for statistical data.	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2						1			1			1
CO2	2	2	1							1			1		
CO3	3	2	2										1		
CO4	3	3	1							1		1		2	
CO5	3	2	2	1					1			1			1
3: Substantial (High)				2: Moderate (Medium)						1: Poor (Low)					



ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)		
I	II	III			
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage	
40%	30%	30%	100%	100%	
MI			MI	MI	
MII	MII		MII	MII	
	MIII		MIII	MIII	
		MIV	MIV	MIV	
		MV	MV	MV	

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer **FIVE** full questions, selecting one full question from each module.





TEXT BOOKS:

1. N.P Bali & Dr. Manish Goyal: "Engineering Mathematics" 9th Edition, Laxmi Publications.
2. Ralph P Grimaldi: Discrete and Combinatorial Mathematics, 5th edition, Pearson Education. 2004.
3. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.

REFERENCE BOOKS:

1. C Ray Wylie, Louis C Barrett: "Advanced Engineering Mathematics", 6th Edition,
2. B.V Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill,
3. Thomas Koshy: Discrete Mathematics with Applications, Elsevier, 2005, Reprint 2008

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://www.youtube.com/watch?v=8Kg21jBCm-k>
2. <https://www.youtube.com/watch?v=Wa6kaCwyYRk>
3. <http://nptel.ac.in/courses.php?disciplineID=111>
4. [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
5. <http://academicearth.org/>
6. <http://www.bookstreet.in>.
7. VTU e-Shikshana Program




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EMBEDDED SYSTEM CONCEPTS WITH ARM

(Effective from the Academic Year 2022 - 2023)

IV SEMESTER

Course Code	21CS42	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40L + 20P	Exam Hours	03

CREDITS – 4

COURSE PREREQUISITES:

- Fundamental knowledge of Computer Organization and Programming.

COURSE OBJECTIVES:

This course will enable students to:

- Understand the fundamentals of ARM based systems, basic hardware components, selection methods and attributes of an embedded system.
- Program ARM controller using the various instructions.
- Identify the applicability of the embedded system.
- Comprehend the real time operating system used for the embedded system

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Embedded System design concepts: Embedded Vs General computing system, History of embedded systems, Classification of Embedded systems, Major applications areas of embedded systems, purpose of embedded systems. Characteristics and Quality Attributes of Embedded Systems, Operational quality attributes, non-operational quality attributes, Embedded Systems-Application and Domain specific, Hardware Software Co-Design and Program Modelling, embedded firmware design and development.

8 Hours

(Text book 2: Chapter 1 (Sections 1.2 to 1.6); Chapter-3, Chapter-4, Chapter-7 (Sections 7.1, 7.2 only), Chapter-9 (Sections 9.1, 9.2, 9.3.1, 9.3.2 only))

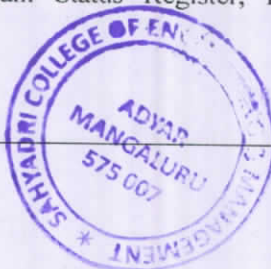
MODULE - II

ARM Embedded Systems: RISC, ARM Design Philosophy, Embedded System Hardware and Software.

8 Hours

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

(Text book 1: Chapter 1 - 1.1 to 1.4, Chapter 2 - 2.1 to 2.5)





MODULE - III

ARM Instructions Set: Data Processing Instructions, Branch Instructions, Load-Store Instructions, Software Interrupt Instructions, Program Status Register Instruction. (Text book 1: Chapter 3: Sections 3.1 to 3.6 (Excluding 3.5.2))	8 Hours
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MODULE - IV

Interfacing: Interfacing Sensors, Actuators, LED, 7 segment display, stepper motor, Keyboard, Push button switch, Timers. Communication Interface (onboard and external types), Embedded firmware, Other system components. (Text book 2: Chapter 2 (Sections 2.1 to 2.6))	8 Hours
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MODULE - V

RTOS and IDE for Embedded System Design: Real time Operating System basics, how to choose an RTOS, Integration and testing of Embedded hardware and firmware, Embedded system Development Environment. Case Study: VxWorks v/s Lynx OS. Text book 2: Chapter-10 (Sections 10.1 to 10.10 only), Chapter 12, Chapter-13 (13.1.1)	8 Hours
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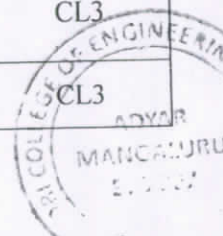
COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Describe the characteristics and quality attributes for designing an embedded system.	CL2
CO2	Illustrate the architectural features of ARM controller with assembly language program	CL3
CO3	Develop programs using Instruction Set Architecture of ARM controller.	CL3
CO4	Interface the peripheral devices with LPC2148 microcontroller.	CL3
CO5	Demonstrate the real time operating system by using VXWorks and Lynx OS.	CL3

LABORATORY COMPONENTS

Exp. No.	Experiment Description	CO No.	Bloom's Taxonomy Level
1.	Implement an ALP to (a) add two 16 bit binary numbers. (b) find factorial of a number.	CO1	CL3
2.	Implement an ALP to find the square of a number (1 to 10) using look-up table.	CO2	CL3
3.	Implement an ALP to find the largest/smallest number in an array of 32 numbers.	CO3	CL3
4.	Implement an ALP to arrange a series of 32-bit numbers in ascending/descending order.	CO3	CL3
5.	Implement an ALP to count the number of ones and zeros in two consecutive memory locations.	CO3	CL3
6.	Display "Hello World" message using Internal UART.	CO4	CL3
7.	Interface (a) Stepper motor (b) DC motor to rotate it in clockwise and anti-clockwise direction.	CO4	CL3
8.	Interface a DAC and generate the following waveforms: a. Square wave b. Triangular wave	CO4	CL3
9.	Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.	CO4	CL3





10.	Demonstrate the use of an external interrupt to toggle an LED On/Off.	CO4	CL3
11.	Demonstration of embedded system applications to read Temperature/humidity sensor	CO5	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3									1		
CO2	3	3	3									1		
CO3	3	3	3	1	2				1			1		
CO4	3	3	3	1	2				1			1		
CO5	3	3	3							1		1		
3: Substantial (High)				2: Moderate (Medium)						1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Practical Session (Laboratory Component)	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Practical Sessions (40%)		
I	II	III			
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage	
40%	30%	30%	100%	100%	
MI			MI	MI	
MII	MII		MII	MII	
	MIII		MIII	MIII	
		MIV	MIV	MIV	
		MV	MV	MV	

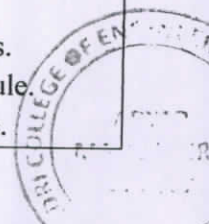
NOTE:

- Assessment will be both CIA and SEE.
- The practical sessions of the IPCC shall be for CIE only.
- The Theory component of the IPCC shall be for both CIA and SEE respectively.
- The questions from the practical sessions shall be included in Theory SEE.

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer **FIVE** full questions, selecting one full question from each module.





TEXT BOOKS:

1. Andrew N Sloss, Dominic Symes and Chris Wright, ARM system developers guide, Elsevier, Morgan Kaufman publishers, 2008. (Chapters: 1, 2, 3, 4, 5, 6, 7)
2. Shibu K V, "Introduction to Embedded Systems", Tata McGraw Hill Education, Private Limited, 2nd edition. (Chapters: 9, 10, 12)

REFERENCE BOOKS:

1. William Hohl, Christopher Hinds ARM ASSEMBLY LANGUAGE Fundamentals and Techniques, 2nd Edition, CRC Press, 2015.
2. Gibson ARM Assembly Language An Introduction, Second Edition, 2007.
3. Steve Furber, ARM System-on-Chip Architecture, Second Edition, Pearson, 2015.
4. Raj Kamal, Embedded System, Tata McGraw-Hill Publishers, 2nd Edition, 2008.



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OPERATING SYSTEMS
(Effective from the Academic Year 2022 - 2023)

IV SEMESTER

Course Code	21CS43	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40L + 20P	Exam Hours	03

CREDITS – 4

COURSE PREREQUISITES:

- Data Structures, Object Oriented Programming, Computer Organization..

COURSE OBJECTIVES:

- Students will understand the types of operating system and ability to create threads and perform Inter process communication.
- Students can understand CPU scheduling and be able to solve process synchronization problems.
- Students can understand the issues surrounding deadlock handling and memory management.
- Students can gather knowledge about paging and segmentation methods suitable for virtual memory. Ability to manage files and directory.
- Students will be able to understand the recovery and manage disk spaces. Knowledge of files systems and Android OS.
- Students can simulate the working of operating system, also algorithm used in operating system and develop dummy operating system

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Operating Systems and Structures: Introduction, user view, system view, Single processor systems, multiprocessors systems, clustered systems, multiprogramming and multitasking, dual mode and multimode operations, Distributed systems, Computing environments, Operating System services, System Calls, Linkers and Loader, Operating system design and implementation, Operating System Structures.

8 Hours

Process Management: Process concept, process state, process control block, context switch; operations on processes, inter process communication.

MODULE - II

Multi-Threaded Programming: Overview of threads, multithreading models, thread libraries, threading issues.

8 Hours

CPU Scheduling: Schedulers, Pre-emptive and non-pre-emptive scheduling, dispatcher; Scheduling Criteria.

Scheduling Algorithms: FCFS, SJF, SRTF, RR, Priority, HRRN, multi-level feedback Queue scheduling, Multiprocessor scheduling.

MODULE - III

Process Synchronization: Background, critical section problem, Peterson's solution; synchronization hardware- mutex, semaphores, monitors.

8 Hours





Deadlocks: System model, necessary conditions for deadlocks, methods for handling deadlocks, deadlock prevention, deadlock avoidance -resource allocation graph algorithm, banker's algorithm, deadlock detection, recovery from deadlock

MODULE - IV

Memory Management: Background, contiguous memory allocation, paging, swapping.
Virtual Memory Management: Background; demand paging: copy-on-write; page replacement algorithms - FIFO, Optimal, LRU; thrashing

8 Hours

File System Interface and Operations: Access methods, Directory structures, Protection, File system structure, Directory implementation, Allocation methods, Free space management.

MODULE - V

Storage Management and Security: Mass storage structures; Disk scheduling algorithms, Swap space management.

8 Hours

Protection: Goals, Principles and Domains of protection, Access matrix, Implementation of access matrix, Revocation of access rights, Access control.

COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Illustrate the operating system, its components, and the ideas behind system calls and inter-process communication.	CL3
CO2	Apply the concepts of multithreading and demonstrate various algorithms by considering different scheduling criteria.	CL3
CO3	Illustrate the process synchronization, its classical approaches and discuss the concepts of deadlock.	CL3
CO4	Apply the concept of memory management, demand paging, and demonstrate the working of various page replacement algorithms and file system operations.	CL3
CO5	Analyze the structure of mass storage devices, various disk scheduling techniques and concepts of operating system protection.	CL4

LABORATORY COMPONENTS

Exp. No.	Experiment Description	CO No.	Bloom's Taxonomy Level
1.	Demonstrate the system assembly and disassembly of computer hardware components	CO1	CL2
2.	Demonstrate the Process creation and Termination using System calls -fork(), vfork(), exit(), return 0.	CO1	CL3
3.	Simulate the following CPU scheduling algorithms 1. FCFS 2. SJF 3. Priority 4. Round Robin.	CO2	CL3
4.	Demonstrate the following Classical problems of synchronization problems using a. producer-consumer, b. reader writer, c. dining philosopher semaphores.	CO3	CL3
5.	Apply Banker's algorithm for deadlock avoidance.	CO3	CL3
6.	Demonstrate following page replacement algorithms- a. FIFO, b. LRU and c. OPTIMAL.	CO4	CL3



7.	Analyze the seek time for the following Disk scheduling algorithms – 1. FCFS, 2. SCAN, 3. C-SCAN, 4. LOOK, 5. C-LOOK	CO5	CL3
8.	Simulate and Analyze following file allocation strategies –Indexed and sequential approaches.	CO5	CL3
9.	Demonstrate the OS installation with Multi Booting and Virtual Machine platform, OS Protection and Security – Firewall, Protections, Threat Detections and prevention.	CO1, CO5	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	1	1			1	2	1		2		
CO2	3	3	3	2	1			1	2	1		2		
CO3	3	3	3	2	1			1	2	1		2		
CO4	3	3	3	2	1			1	2	1		2		
CO5	3	3	3	3	2			1	2	1		2		
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Practical Session (Laboratory Component)	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Practical Sessions (40%)		
I	II	III			
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage	
40%	30%	30%	100%	100%	
MI			MI	MI	
MII	MII		MII	MII	
	MIII		MIII	MIII	
		MIV	MIV	MIV	
		MV	MV	MV	

NOTE:

- Assessment will be both CIA and SEE.
- The practical sessions of the IPCC shall be for CIE only.
- The Theory component of the IPCC shall be for both CIA and SEE respectively.
- The questions from the practical sessions shall be included in Theory SEE.

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.





SEE QUESTION PAPER PATTERN:

1. The question paper will have **TEN** full questions from **FIVE** Modules
2. There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
3. Each full question may have a maximum of four sub-questions covering all the topics under a module.
4. The students will have to answer **FIVE** full questions, selecting one full question from each module.

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Principles", 10th edition, Wiley-India, 2021
2. M. Morris Mano, "Computer System Architecture", PHI, 3rd Edition

REFERENCE BOOKS:

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



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DESIGN AND ANALYSIS OF ALGORITHMS

(Effective from the Academic Year 2022 - 2023)

IV SEMESTER

Course Code	21CS44	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Fundamental knowledge of Mathematics, Data Structures.

COURSE OBJECTIVES:

- Describe the techniques for analyzing algorithms and how to evaluate their performance. Indicate the effectiveness of the method using asymptotic notations.
- Utilize algorithm design techniques including the brute force approach, greedy approach, divide-and-conquer strategy, decrease-and-conquer strategy, transform-and-conquer strategy, dynamic programming, backtracking, and branch-and-bound to solve issues.
- Decide on the best data structure and algorithm design technique for the given application.
- Recognize the fundamental ideas behind NP-complete and NP-hard class issues.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction to Algorithms- Properties, Specification, Fundamentals of Algorithmic Problem solving, Analysis Framework. **8 Hours**

Performance Analysis: Estimating Space complexity and Time complexity of algorithms. Asymptotic Notations with examples, Basic efficiency classes, Mathematical analysis of Non-Recursive and Recursive Algorithms with Examples.

Brute force design techniques: Selection sort, sequential search and String-matching algorithm with complexity Analysis.

Textbook 1: Chapter 1(Section 1.1,1.2), Chapter 2(section 2.1, 2.2, 2.3, 2.4), Chapter 3(3.1, 3.2)

Textbook 2: Chapter 1(Sections 1.1,1.2)

MODULE - II

Divide and Conquer: General method, Recurrence equation for divides and conquers, solving it using Master's theorem. , Divide and Conquer algorithms and complexity Analysis of Finding the maximum & minimum, Binary search, Merge sort, Quick sort. **8 Hours**

Decrease and Conquer Approach: Introduction, Insertion sort, Topological Sorting and efficiency analysis.

Textbook 1: Chapter 4 (Sections 4.1,4.2,4.3), Chapter 5(Section 5.1,5.3)

Textbook 2: Chapter 3(Sections 3.1,3.3,3.4,3.5,3.6)





MODULE - III

Greedy Method: General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines, Minimum cost spanning tree algorithms: Prim's Algorithm, Kruskal's Algorithm. **Single source shortest paths:** Dijkstra's Algorithm. **Optimal Tree problems:** Huffman Trees and Codes. **Transform and Conquer Approach:** Heaps and Heap Sort.

Textbook 1: Chapter 9(Section 9.1,9.2,9.3,9.4), Chapter 6(section 6.4)

Textbook 2: Chapter 4(Sections 4.1,4.3,4.5)

8 Hours

MODULE - IV

Dynamic Programming: General method with Examples, Multistage Graphs.

Transitive Closure: Warshall's Algorithm. All Pairs Shortest Paths: Floyd's Algorithm, Knapsack problem, Optimal Binary Search Trees, Travelling Sales Person problem.

Space-Time Tradeoffs: Sorting by Counting, Input Enhancement in String Matching Harspool's algorithm.

Textbook 1: Chapter 8(Sections 8.2,8.3,8.4), Chapter 7 (Sections 7.1,7.2)

Textbook 2: Chapter 5 (Sections 5.1,5.2,5.5, 5.9)

8 Hours

MODULE - V

Backtracking: General method, N-Queens problem, Sum of subsets problem, Graph colouring, Hamiltonian cycles Problems.

Branch and Bound: Basic concepts, Assignment Problem, Travelling Sales Person problem, 0/1 Knapsack problem.

NP-Complete and NP-Hard problems: Basic concepts, Non- deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes.

Textbook 1: Chapter 12 (Sections 12.1,12.2) Chapter 11(Section 11.3)

Textbook 2: Chapter 7 (Sections 7.1,7.2,7.3,7.4,7.5) Chapter 11 (Section 11.1)

8 Hours

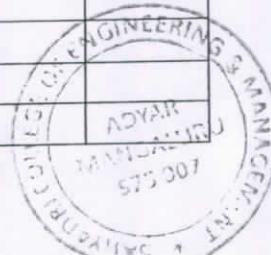
COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Solve the time complexity of recursive, non-recursive and brute force algorithm using asymptotic notations.	CL3
CO2	Solve the recurrence relation to obtain the performance of divide-and-conquer, decrease-and-conquer approach.	CL3
CO3	Apply greedy technique, transform and conquer strategy to solve the problem for optimal solution.	CL3
CO4	Determine the time complexity for Dynamic-Programming paradigm and String-matching techniques.	CL3
CO5	Apply backtracking and branch-and-bound approach on combinatorial problems and categorize algorithms as P, NP, NP-complete and NP-hard classes.	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	1		1						3		
CO2	3	3	2	1		1						3		
CO3	3	3	3	1		1						3		
CO4	3	3	3	1		1						3		





CO5	3	3	3	1		1					3		
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)			

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)		
I	II	III			
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage	
40%	30%	30%	100%	100%	
MI			MI	MI	
MII	MII		MII	MII	
	MIII		MIII	MIII	
		MIV	MIV	MIV	
		MV	MV	MV	

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration • and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

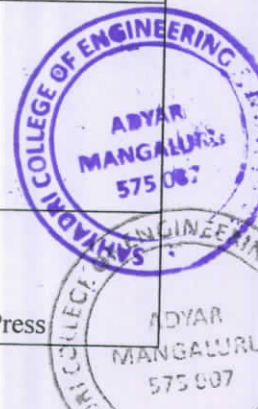
Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer **FIVE** full questions, selecting one full question from each module.

TEXT BOOKS:

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin: 3rd Edition, Pearson.
2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, Universities Press



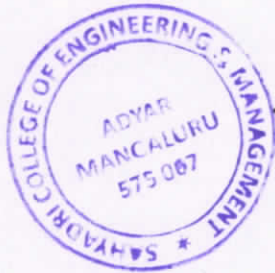


REFERENCE BOOKS:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
2. Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education).

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. https://www.youtube.com/watch?v=gY0MwGLq9W8&list=PLyqSpQzTE6M9DKhN7z2fOpKTJWu-639_P
2. <https://www.youtube.com/watch?v=5Y8Lfsreeck&list=PL7DC83C6B3312DF1E>
3. https://www.youtube.com/watch?v=S47aSEqm_0I&list=PLgj_V-ZKxRKrxgFyOutPJpoLFBaQMOpK-




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BIOLOGY FOR ENGINEERS (Effective from the Academic Year 2021 - 2022) IV SEMESTER			
Course Code	21BE45	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	2:0:0:0	SEE Marks	50
Total Hours of Pedagogy	30L	Exam Hours	03
CREDITS – 2			
COURSE PREREQUISITES: Basic Concepts of Biology			
COURSE OBJECTIVES: - Implementation of new technology in medical Science. - Use modern technical skills to bring out innovations in medical field.			
TEACHING - LEARNING STRATEGY: Following are some sample strategies that can be incorporate for the Course Delivery - Chalk and Talk Method/Blended Mode Method - Power Point Presentation - Expert Talk/Webinar/Seminar - Video Streaming/Self-Study/Simulations - Peer-to-Peer Activities - Activity/Problem Based Learning - Case Studies - MOOC/NPTEL Courses - Any other innovative initiatives with respect to the Course contents			
COURSE CONTENTS			
MODULE - I			
Human Anatomy –Biology, classification, nature and scope. Cell – The unit of life – Meaning of cell, the Plant Cell and animal Cell, protoplasm, Plant Tissue and Animal Tissue. Brain as a CPU system - architecture, CNS and Peripheral Nervous System, signal transmission, EEG.			6 Hours
MODULE - II			
Common Diseases and Vaccination - Allergies, Colds and Flu - causes and precautions. First vaccine in the world, Vaccine for Rabies and RNA vaccines for COVID- critical analysis, case study of process of development of COVID vaccine.			6 Hours
Forensics – DNA fingerprinting. Engineering solutions for Parkinson's disease. Heart disease and its types. Modern technologies to detect heart diseases.			
MODULE - III			
Biosensors: Various components of biosensors, Transducers in Biosensors: Various types of transducers; principles and applications, applications of biosensors.			6 Hours
Telemedicine: Block diagram of telemedicine system, origin and development of Telemedicine, Benefits and limitations of Telemedicine.			
MODULE - IV			
Biomechanics of Joints: Skeletal Joints, Skeletal Muscles, Joint Function, forces and stresses in human joints, Mechanics of the Elbow, Shoulder, Spinal Column, Hip, Knee and Ankle, Applications of prosthetics.			6 Hours
Bio-fluid Mechanics: Circulatory System in the Human Body, Modeling of Flow in Blood Vessels, Blood Flow Theory.			





Biomaterials: Definition and classification of biomaterials, biocompatibility and biodegradability, Biomedical Implants.	
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MODULE - V

Artificial intelligence for Medical Application: Introduction to Artificial intelligence and machine learning in medical Science. Application of AI in Imaging and Computer-aided Diagnosis, Neuroscience and drug discovery, Genetic algorithms.	6 Hours
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COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Interpret the basics of cell biology and brain functions.	CL2
CO2	Understand effect of common diseases, types of vaccination and general forensics.	CL2
CO3	Summarize the application of biosensors and telemedicine in medical science.	CL2
CO4	Visualize biomechanical joints, biofluid mechanics and bio materials in medical science.	CL2
CO5	Contrast innovative methods of information technology in computer aided medical diagnosis.	CL2

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	1	1			1			1	1		1		
CO2	1	1	1			2			1	1		1		
CO3	1	2	2			1			1	1		1		
CO4	1	2	2			2			1	1		1		
CO5	1	2	2			1			1	1		1		
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)		
I	II	III			
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage	
40%	30%	30%	100%	100%	
MI			MI	MI	
MII	MII		MII	MII	
	MIII		MIII	MIII	
		MIV	MIV	MIV	
		MV	MV	MV	



Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Case Studies	25 %	05
3	Seminar/Presentation	25 %	05
4	Peer - to - Peer Learning	25 %	05

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

1. The question paper will have TEN full questions.
2. Each full question consists of 20 marks.
3. There will be 2 full questions from all the FIVE modules.
4. Each full question will have a maximum of three sub-questions covering all the topics under a module.
5. The students will have to answer 5 full questions, selecting one full question from each module.

TEXT BOOKS:

1. Brian R Eggins - Biosensors an Introduction, First edition, John Wiley & Sons Publishers, 1996.
2. R S Khandpur, "Telemedicine technology and applications", PHI Learning Pvt. Ltd, New Delhi, 2017.
3. N. Ozkaya and M. Nordin: Fundamentals of Biomechanics-Equilibrium, Motion and Deformation, Springer-Verlag, 2nd Edition, 1999.

REFERENCE BOOKS:

1. Biomaterials Science and Tissue Engineering: Principles and Methods, by Bikramjit Basu, Cambridge IISc Series.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://www.youtube.com/watch?v=96-u9s6D16k>
2. https://www.youtube.com/watch?v=4_emccqgYMs
3. https://onlinecourses.nptel.ac.in/noc22_cs56/preview
4. https://onlinecourses.nptel.ac.in/noc22_cs29/preview



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DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY WITH PYTHON

(Effective from the Academic Year 2022 - 2023)

IV SEMESTER

Course Code	21CSL46	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	0:0:2:1	SEE Marks	50
Total Hours of Pedagogy	24P+12S	Exam Hours	03

CREDITS – 1

COURSE PREREQUISITES:

- Knowledge of Mathematics, Data Structures and Python Programming
- Usage of IDEs like Jupyter Notebook/PyCharm

COURSE OBJECTIVES:

This course will enable students to:

- Design, analyze, and implement various algorithms in Python.
- Make use of different algorithmic design techniques to solve problems.
- Analyze and contrast the effectiveness of various algorithms.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

Descriptions:

Installation procedure of the required software must be demonstrated, carried out in groups and documented in the journal.

Pre-requisite Experiments

Sl. No.	Description
1	Write a Python program to create an array of 5 integers and display the array items. Access individual elements through indexes.
2	Write a Python program to find the greatest common divisor (gcd) of two integers.
3	Write a Python program to construct the following pattern, using a nested for-loop. <pre> * * * * * * * * * </pre>



Algorithm Implementation using Python Programming (Max. Marks: 50)

Design, develop, and implement the specified algorithms using Python Programming under LINUX/Windows environment.





LIST OF EXPERIMENTS

Sl. No.	Description
1	Design an application to create a list of TV channels (minimum 10) that includes the numbers of viewers and viewing time. Rate the channels based on the number of viewers (1 High - 6 low). Plot graphs to analyze the running times of different sorting algorithms.
2	Design and implement an application that considers the problem of scheduling n jobs of known durations $t_1, t_2, \dots, t_n$ for execution by a single processor. The jobs can be executed in any order, one job at a time. Find and display the schedule that minimizes the total time spent by all the jobs in the system by maximizing the profit.
3	Develop an optimal route for a scenario where a person wants to buy a ticket to a baseball game. Along the way from house to reaching the destination, some known person who lives on that street might give money. Visit towns for the collection of more money to buy a ticket.
4	Design an application for a thermal power station and electrical lines that are connected among various power stations. The costs of electrification involved appear as weights on the edges. Obtain the minimum possible connection among the thermal stations so that any two thermal stations can be linked with the minimum cost involved.
5	Develop a program for the following: a. To construct a Huffman code for a given English text and encode it. b. To decode an English text which has been encoded with a Huffman code.
6	The owner of a gourmet coffee shop wishes to mix a 10-pound bag of coffee using various types of coffee beans in such a way to produce the coffee blend at the maximum cost. The weights of the objects in the problem correspond to the quantity in pounds available of each type of coffee bean. The value of each quantity of coffee beans is the total cost of that quantity in rupees. Apply the Knapsack algorithm to maximize the profit.
7	Design an application for drilling an optimal printed circuit board. To drill two holes of different diameters consecutively, the head of the machine has to move to a toolbox and change the drilling equipment. This is quite time consuming. Thus, it is clear that one has to choose some diameter, drill all holes of the same diameter, change the drill, drill the holes of the next diameter, etc. Thus, this drilling problem has to minimize the travel time for the machine head. Find the optimal time to drill the circuit board.
8	Design an application for the university to schedule an exam. Given a list of different subjects and students who are enrolled in many subjects, many subjects would have common students of the same batch, some backlogged students, etc. Find the solution to the following: a. Obtain the schedule for the exam so that no two exams with a common student are scheduled at the same time. b. How many minimum time slots are needed to schedule all exams?
9	Design and implement for a given chess board having $N \times N$ cells, place N queens on the board in such a way that no queen attacks any other queen. If it is possible to place all the N queens in such a way that no queen attacks another queen, then print N lines having N Queens. If there is more than one solution of placing the queens, print all of them. If it is not possible to place all N queens in the desired way, then print "Not possible".





COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Implement Python data structures – lists, tuples & dictionaries to represent compound data.	CL3
CO2	Design, analyze and implement the brute force, divide and conquer algorithms and compare their time complexity.	CL4
CO3	Design and implement the greedy technique algorithms to solve the problem for optimal solution.	CL3
CO4	Apply dynamic programming techniques to solve Travelling Salesperson Problem and Knapsack problem.	CL3
CO5	Implement and validate combinatorial problems using backtracking, branch and bound methods.	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	1	3			2	2	1	1	2		
CO2	3	3	3	1	3			2	2	1	1	2		
CO3	3	3	3	1	3			2	2	1	1	2		
CO4	3	3	3	1	3			2	2	1	1	2		
CO5	3	3	3	1	3			2	2	1	1	2		
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Laboratory Work (A)	50 %	25
	Laboratory Test (B)	30 %	15
	Open Ended Experiments /Mini Projects (C)	20 %	10
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT STRATEGY:

- I. In Laboratory Courses where (B) and (C) are not the components of the assessment pattern, then (A) will have 100% weightage (50 Marks).

Assessment Mode: Weekly Assessment of Laboratory Work (50 Marks) - the marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment, each of 25 marks) of the students in each laboratory session. The average of all the marks obtained across the sessions will be the Final CIA marks.

- II. In Laboratory Courses where (C) is not a component of the assessment pattern, then (A) will have 50% weightage (25 Marks), and (B) will have 50% weightage (25 Marks).

Assessment Mode: The marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment) (A) and One Laboratory Test (B).

- In Weekly Assessment, the student will be evaluated in each laboratory session for 25 marks. The average marks obtained across all the experiments will be the marks obtained for (A).
- A Laboratory Test, similar to the SEE exam is conducted towards the end of the Semester/Course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B)

The Sum of marks obtained across (A) and (B) will be the Final CIA marks.

- III. In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by



considering the weightages given above, i.e. (A) – 25 Marks (Weekly Assessment), (B) – 15 Marks (Laboratory Examination), (C) – 10 marks (Open Ended Experiments/Mini Projects)

- The respective course instructor will design the assessment criteria for the said assessment components.
- The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.

In all the cases, the assessments will be done based on the criteria designed by the Course Coordinator.

SEE QUESTION PAPER PATTERN:

1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.
2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

LEARNING RESOURCES:

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin: 3rd Edition, Pearson.
2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahnii and Rajasekaran, 2nd Edition, Universities Press.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://nptel.ac.in/courses/106106182>.



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ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

(Effective from the Academic Year 2022 - 2023)

III/IV SEMESTER

Course Code	21KSK37/47	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15L	Exam Hours	01

CREDITS – 1

COURSE PREREQUISITES:

- Kannada Language & Kannada Literature

COURSE OBJECTIVES:

- To bring out the best talents in students, in terms of language skills.
- To increase students' abilities to use planning, drafting and editing in kannada language to improve their work
- To enable students to write kannada correctly and meaningfully, i.e. to write letters, applications.
- To give an ideology about Kannada Literature.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses

COURSE CONTENTS

MODULE - I

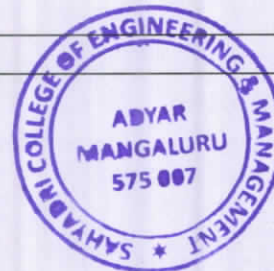
ಘಟಕ - 1 ಅರ್ಜಿಗಳು, ಪತ್ರಗಳು	3 Hours
ಪತ್ರ ವ್ಯವಹಾರ - ಸರ್ಕಾರಿ ಪತ್ರಗಳು, ಅರೆಸರ್ಕಾರಿ ಪತ್ರಗಳು ಮತ್ತು ವೈಯಕ್ತಿಕ ಪತ್ರಗಳು ಅಕ್ಷಾನ್ ಪತ್ರಿಕೆ, ಜಾಹೀರಾತು, ಪತ್ರಿಕಾ ಪ್ರಕಟಣೆ ಅರ್ಜಿ ನಮೂನೆಗಳು	

MODULE - II

ಘಟಕ - 2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯಭಾಗ	3 Hours
ವಚನಗಳು: ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರ ದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ ಕೀರ್ತನೆಗಳು: ಅದರಿದೇನು ಫಲ ಇದರಿದೇನು ಫಲ - ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸಿದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು ತತ್ವಪದಗಳು: ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು - ಶಿಶುನಾಳ ಶರೀಫರು	

MODULE - III

ಘಟಕ - 3 ಆಧುನಿಕ ಕಾವ್ಯ ಭಾಗ	3 Hours
ಡಿವಿಜಿ ಯವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು ಕುರುಡು ಕಾಂಚಾಣ : ದ. ರಾ. ಬೇಂದ್ರೆ ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು	





MODULE - IV

ಘಟಕ - 4 ಲೇಖನಗಳು

3 Hours

ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ.ಎನ್. ಮೂರ್ತಿರಾವ್

ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ - ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ

MODULE - V

ಘಟಕ - 5 ಕಥೆಗಳು

3 Hours

ಯುಗಾದಿ - ವಸುದೇಂದ್ರ

ಬೆಡ್ ನಂಬರ್ ಏಳು - ತ್ರಿವೇಣಿ

COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	ಪತ್ರ ಮತ್ತು ಅರ್ಜಿ ನಮೂನೆಗಳನ್ನು ದಿನ ಬಳಕೆಯಲ್ಲಿ ಬಳಸುತ್ತಾರೆ.	CL3
CO2	ಮಧ್ಯಯುಗೀನ ಸಾಹಿತ್ಯದ ಓದು ಸಾಮಾಜಿಕ ಜವಬ್ದಾರಿಯ ನೆಲೆಯಿಂದ ಕೆಲಸ ಮಾಡುತ್ತದೆ.	CL3
CO3	ವಿಭಿನ್ನ ಬಗೆಯ ಆಧುನಿಕ ಕಾವ್ಯದ ರಚನೆಯಲ್ಲಿ ತೊಡಗಿಸಿಕೊಳ್ಳುತ್ತಾರೆ.	CL3
CO4	ಉದಾತ್ತ ವ್ಯಕ್ತಿತ್ವಗಳು ಬದುಕಿನಲ್ಲಿ ಪಾಲಿಸಿದ ಆದರ್ಶವನ್ನು ಅಳವಡಿಸಿಕೊಳ್ಳುತ್ತಾರೆ.	CL3
CO5	ಆಧುನಿಕ ವಿಜ್ಞಾನಕ್ಕೆ ಮೂಲಧಾತುವಾಗುವ ಪರಂಪರೆಯ ವಿಜ್ಞಾನವನ್ನು ತಮ್ಮ ವೃತ್ತಿ ಬದುಕಿನಲ್ಲಿ (ಸ್ಪಾರ್ಟ್) ಬಳಸುತ್ತಾರೆ.	CL3
CO6	ಭಿನ್ನ ಸಣ್ಣ ಕಥೆಗಳು ವಿಷದ ಪಡಿಸುವ ಸಿದ್ಧಾಂತಗಳು ಮತ್ತು ನಿರೂಪಣಾ ಕ್ರಮವನ್ನು ತಮ್ಮ ಬರವಣಿಗೆಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳುತ್ತಾರೆ.	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1						2		2	1	2		2		
CO2								2		3		1		
CO3							1			1		3		
CO4										2		2		
CO5						1				2		2		
										3		2		

3: Substantial (High)

2: Moderate (Medium)

1: Poor (Low)

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50



ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)			Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIII	MIV	MIV
		MIV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	25 %	05
5	Peer - to - Peer Learning	15 %	03

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **seventy MCQ** questions and **six** main questions.
- Each MCQ questions consisting of 1 mark; and main questions of 5 marks.
- Main questions will be asked from all FIVE modules.

TEXT BOOKS:

- ಡಾ. ಹಿ. ಚಿ. ಬೋಲರಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ - ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ, ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ. 1st Edition, 2020
- ಆಡಳಿತ ಕನ್ನಡ (ಪತ್ರಿಕೆ - ೧, ಬ್ಲಾಕ್ ೪) ಪ್ರಕಟಣೆ: ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಮೈಸೂರು, 1st Edition, 2015
- ಕನ್ನಡ ಮನಸು - ಇಂಜಿನಿಯರಿಂಗ್ ಪ್ರಥಮ ಪದವಿ ತರಗತಿ ಕನ್ನಡ ಪಠ್ಯ, ಪ್ರಕಟಣೆ: ಪ್ರಸಾರಾಂಗ ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ, 5th Edition, 2018

REFERENCE BOOKS:

- ಕನ್ನಡ ಸಾಹಿತ್ಯ ಸಂಗಾತಿ - ಕನ್ನಡ ಸಾಹಿತ್ಯ ಅಕಾಡೆಮಿ, 2017
- ಕನ್ನಡ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ - ರಂ. ಶ್ರೀ. ಮುಗಳಿ, ಉಷಾ ಸಾಹಿತ್ಯ, ಮೈಸೂರು
- ಸಮಗ್ರ ವಚನ ಸಂಪುಟಗಳು - ಎಂ. ಎಂ. ಕಲಬುರ್ಗಿ, ಕನ್ನಡ ಮತ್ತು ಸಂಸ್ಕೃತಿ, ನಿರ್ದೇಶನಾಲಯ, ಬೆಂಗಳೂರು.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

- https://shashiexambooks.blogspot.com/2018/02/blog-post_20.html
- <https://themindpalace.in/index.php/category/kannada/kannada-authors/>



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ಬಳಕೆ ಕನ್ನಡ

(Effective from the Academic Year 2022 - 2023)

III/IV SEMESTER

Course Code	21KBK37/47	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15L	Exam Hours	01

CREDITS – 1

COURSE PREREQUISITES:

- Kannada Language & Kannada Literature

COURSE OBJECTIVES:

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

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses

COURSE CONTENTS

MODULE - I

Introduction, Necessity of learning a local language. Methods to learn the Kannada language.
Easy learning of a Kannada Language: A few tips.
Hints for correct and polite conservation,
Listening and Speaking Activities
Key to Transcription. Kannada letter writing practice.

3 Hours

MODULE - II

Personal Pronouns, Possessive Forms, Interrogative words Possessive forms of nouns, dubitive question and
Relative nouns
Qualitative, Quantitative and Colour Adjectives, Numerals.
Predictive Forms, Locative Case

3 Hours

MODULE - III

Dative Cases, and Numerals
Ordinal numerals and Plural markers
Defective / Negative Verbs
Different types of Tenses

3 Hours

MODULE - IV

Permission, Commands, encouraging and Urging words (Imperative words and sentences)
Helping Verbs “iru and iralla”, Corresponding Future and Negation Verbs.
Comparative, Relationship, Identification and Negation Words.

3 Hours





MODULE - V

Conversation :

Introducing each other
Telephone Conversation
Conversation in Market
Enquiry about College

8 Hours

COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Understand the importance of Kannada language and pronunciation in communication.	CL2
CO2	Applying the different forms of nouns, ordinal numerals and different forms of adjectives while using Kannada language in conversation.	CL3
CO3	Communicate effectively using the defective / negative Verbs and different types of tenses.	CL2
CO4	Applying permission, command, encourage, comparative, relationship, identification and negation words during Kannada conversation.	CL3
CO5	Converse in Kannada language.	CL2

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1										2		1		
CO2									2	3		1		
CO3									2	3		1		
CO4									2	2		1		
CO5									3	3		1		
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)		
I	II	III			
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage	
40%	30%	30%	100%	100%	
MI			MI	MI	
MII	MII		MII	MII	
	MIII		MIII	MIII	
		MIV	MIV	MIV	
		MV	MV	MV	



Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	25 %	05
5	Peer - to - Peer Learning	5 %	01
6	Activity Based Learning	10 %	02

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **seventy MCQ** questions and **six** main questions.
- Each MCQ questions consisting of 1 mark; and main questions of 5 marks.
- Main questions will be asked from all FIVE modules.

TEXT BOOKS:

1. ಬಳಕೆ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ; ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.
2. ವ್ಯಾಪಕಾರಿಕ ಕನ್ನಡ (ಪತ್ರಿಕೆ - ೧, ಬ್ಲಾಕ್ ೪) ಪ್ರಕಟಣೆ: ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮುದ್ರಣ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಮೈಸೂರು.

REFERENCE BOOKS:

1. Kannada Kali (ಕನ್ನಡ ಕಲಿ) - ಲಿಂಗದೇವರು ಹಳಮನೆ, A Text Book to Learn Kannada by Non - Kannadigas who come to study Diploma, Engineering and Health Sciences in Karnataka, ಪ್ರಕಟಣೆ: ಪ್ರಸಾರಾಂಗ ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
2. Spoken Kannada - ಮಾತನಾಡುವ ಕನ್ನಡ, ಪ್ರಕಟಣೆ - ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ ಬೆಂಗಳೂರು.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://www.wikihow.com/Learn-Kannada>
2. <https://www.languageshome.com/English-Kannada.htm>
3. <https://www.alllanguageresources.com/kannada/>



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CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAWS

(2021- Scheme; Effective from the Academic Year 2022 - 2023)

III/IV-SEMESTER

Course Code	21CIP37/47	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	18	Exam Hours	01

CREDITS – 1

COURSE PREREQUISITES:

- Understanding of Social Science and Civics

COURSE OBJECTIVES:

- To Assimilate and get familiarized with basic information about Indian Constitution and provide overall legal literacy to the young technocrats to manage complex societal issues in the present scenario
- To identify their individual roles and ethical responsibilities towards society.
- To understand engineering ethics & responsibilities, through the learning of these topics students will be able to understand human rights/values and its implications in their life.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction and Basic Information about making of Indian Constitution. The role of the Constituent assembly after partition of India. Modern Indian political Boundaries. Preamble of the constitution. Citizenship provisions. Fundamental rights and its enforcement. Fundamental Duties and its scope and significance in Nation building. Directive Principles of state policy and its present relevance in our society with examples.

8 Hours

MODULE - II

Union Executive, Union Legislature and Union Judiciary. State Executive, State Legislature, State Judiciary. Parliamentary Committees, Important Parliamentary Terminologies & Judicial Reviews

3 Hours

MODULE - III

Election Commission of India. Emergency Provisions such as national emergency, state emergency and financial emergency. Amendment Provisions to Constitution. Panchayat & Municipality/ urban local administration. Special Constitutional provisions for SC & ST, OBC.

2 Hours

MODULE - IV

Scope and Aims of Engineering & Professional Ethics. Business Ethics, Corporate Ethics, Personal Ethics. Engineering and Professionalism, Positive and Negative faces of Engineering Ethics. Code of Ethics as defined in the website of Institution of Engineers. Profession, Professionalism and Professional Responsibility. Clash of Ethics. Conflict of Interest.

2 Hours

Responsibilities in Engineering. Impediments to Responsibility. IPR (Intellectual Property Rights)





MODULE - V														
Cyber Laws its objectives and functions. Types of Cyber Crimes. Internet censorship. Enforcement agencies. Information Technology Act, 2000.													3 Hours	
COURSE OUTCOMES														
Upon completion of this course, the students will be able to:														
CO No.	Course Outcome Description												Bloom's Taxonomy Level	
CO1	Interpret Indian Constitution as the fundamental law of nation.												CL2	
CO2	Understand the role of Union Legislature, Union Executive and Union Judiciary in governance of democratic states.												CL2	
CO3	Familiarize election system in India, emergency provisions and sections to protect the interests of the underprivileged.												CL2	
CO4	Outline the professional ethics and responsibilities to establish trust and reliability in Engineering.												CL2	
CO5	Apprehend the objectives and functions of Cyber Laws.												CL2	
CO-PO-PSO MAPPING														
CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1						1		2	1	1		2		
CO2						1		1	1	1		2		
CO3						1		1	1	1		2		
CO4						2		3	1	1		2		
CO5						2		2	1	1		2		
3: Substantial (High)						2: Moderate (Medium)					1: Poor (Low)			
ASSESSMENT STRATEGY														
Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:														
Sl. No.	Assessment Description							Weightage (%)			Max. Marks			
1	Continuous Internal Assessment (CIA)							100 %			50			
	Continuous Internal Evaluation (CIE)							60 %			30			
	Assignments							40 %			20			
2	Semester End Examination (SEE)							100 %			50			
ASSESSMENT DETAILS														
Continuous Internal Assessment (CIA) (50%)										Semester End Exam (SEE) (50%)				
Continuous Internal Evaluation (CIE) (60%)						Assignment/ Activities (40%)								
I	II	III												
Syllabus Coverage						Syllabus Coverage				Syllabus Coverage				
40%	30%	30%				100%				100%				
MI						MI				MI				
MII						MII				MII				
						MIII				MIII				
						MIV				MIV				
						MV				MV				



Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have 50 MCQ questions.
- Each MCQ questions consisting of 1 mark.

TEXT BOOKS:

1. G.B. Reddy, Mohd. Suhaib: "Constitution of India and Professional Ethics" I K International Publishing House Pvt. Ltd.
2. Dr. Jyothi Rattan: "Cyber Laws and Information Technology" Bharath Law House Pvt. Ltd.

REFERENCE BOOKS:

1. J.N. Pandey – "Constitutional Law of India", 49th Ed., 2012, Central Law Agency Publishing
2. M.V Pylee – "Constitution of India", 5th Ed., Vikas Publishing House, New Delhi

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. https://www.youtube.com/watch?v=vq2Q1_v6TNU



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COMPETITIVE PROGRAMMING USING GO

(Effective from the Academic Year 2022 - 2023)

IV SEMESTER

Course Code	21CSL481	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	24P	Exam Hours	02

CREDITS – 1

COURSE PREREQUISITES:

- Basics of any Programming.

COURSE OBJECTIVES:

This course will enable students to:

- Understand the usage of running multiple processes at the same time.
- Unleash the Ability to Write Better and Optimized Codes.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction to Go : Hello-World, Command-Line Arguments, Finding Duplicate Lines, Animated GIFs, Fetching a URL, Fetching URLs Concurrently, A Web Server, Loose Ends.

5 Hours

Program Structure: Names, Declarations, Variables, Assignments, Type Declarations, Packages and Files, Scope.

MODULE - II

Basic Data Types: Integers, Floating-Point Numbers, Complex Numbers, Booleans, Strings, Constants.

5 Hours

Composite Types: Arrays, Slices, Maps, Structs, JSON, Text and HTML Templates.

Functions: Function Declarations, Recursion, Multiple return values, Errors, Function Values, Anonymous functions.

MODULE - III

Methods: Declarations, Methods with a Pointer Receiver, Composing Types by Struct Embedding, Method values and expressions.

5 Hours

Interfaces: Interfaces as Contacts, Interface Types, Parsing flags, Sorting with sort.interface, http.handler interface, error interface, Examples.





MODULE - IV

Goroutines and Channels: Goroutines, Examples, Channels, Looping in parallel, Example: Concurrent Web Crawler, Multiplexing with select, Example: Concurrent Directory Traversal, Cancellation.	5 Hours
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MODULE - V

Packages and Go Tool: Concepts, Import paths, The Package Declaration, Import Declarations, Blank imports, Packages and Naming, The Go Tool	4 Hours
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COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Demonstrate command line arguments.	CL3
CO2	Illustrate basic data types and functions for map data structures.	CL3
CO3	Apply methods and interfaces to build a web server	CL3
CO4	Utilize Go routines and channels to illustrate Synchronization	CL3
CO5	Implement Go packages and Go tools for HTTP requests.	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	1	3			1	2	1		2		
CO2	3	3	2	1	3			1	2	1		2		
CO3	3	3	2	1	3			1	2	1		2		
CO4	3	3	2	1	3			1	2	1		2		
CO5	3	3	2	1	3			1	2	1		2		

3: Substantial (High)

2: Moderate (Medium)

1: Poor (Low)

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Laboratory Work (A)	50 %	25
	Laboratory Test (B)	30 %	15
	Open Ended Experiments /Mini Projects (C)	20 %	10
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT STRATEGY:

- I. In Laboratory Courses where (B) and (C) are not the components of the assessment pattern, then (A) will have 100% weightage (50 Marks).

Assessment Mode: Weekly Assessment of Laboratory Work (50 Marks) - the marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment, each of 25 marks) of the students in each laboratory session. The average of all the marks obtained across the sessions will be the Final CIA marks.

- II. In Laboratory Courses where (C) is not a component of the assessment pattern, then (A) will have 50% weightage (25 Marks), and (B) will have 50% weightage (25 Marks).

Assessment Mode: The marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment) (A) and One Laboratory Test (B).



- In Weekly Assessment, the student will be evaluated in each laboratory session for 25 marks. The average marks obtained across all the experiments will be the marks obtained for (A).
 - A Laboratory Test, similar to the SEE exam is conducted towards the end of the Semester/Course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B)
- The Sum of marks obtained across (A) and (B) will be the Final CIA marks.

III. In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by considering the weightages given above, i.e. (A) = 25 Marks (Weekly Assessment), (B) = 15 Marks (Laboratory Examination), (C) = 10 marks (Open Ended Experiments/Mini Projects)

- The respective course instructor will design the assessment criteria for the said assessment components.
- The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.

In all the cases, the assessments will be done based on the criteria designed by the Course Coordinator.

SEE QUESTION PAPER PATTERN:

1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.
2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

TEXT BOOKS:

1. The Go Programming Language, Alan A. A. Donovan, Google Inc., Brian W. Kernighan Princeton University, Addition Wesley Professional Computing Series
2. Head First Go- A brain friendly Guide, Jay McGavren, O'Reilly publishers




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DATA VISUALIZATION USING R PROGRAMMING

(Effective from the Academic Year 2022 - 2023)

IV SEMESTER

Course Code	21CSL482	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	24P	Exam Hours	02

CREDITS – 1

COURSE PREREQUISITES:

- Knowledge of Programming Subjects like C,C++,Java and Python

COURSE OBJECTIVES:

This course will enable students to:

- Explore and understand how R and R Studio interactive environment.
- To learn and practice programming techniques using R programming.
- Read Structured Data into R from various sources.
- Understand the different data Structures, data types in R.
- To develop small applications using R Programming

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

INPUT/OUTPUT: Accessing the Keyboard and Monitor, Reading and Writing Files, Accessing the Internet .	4 Hours
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MODULE - II

STRING MANIPULATION: An Overview of String-Manipulation Functions, Regular Expressions, Efficient Data Handling in R	4 Hours
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MODULE - III

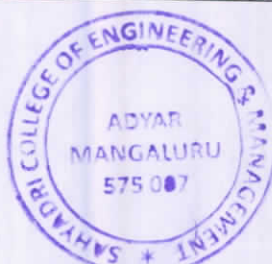
GRAPHICS: Creating Graphs, Customizing Graphs , Saving Graphs to Files	4 Hours
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MODULE - IV

The ggplot2 Package for Graphics: Quick Plots and Basic Control, Working with Layers, Plot Types	4 Hours
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MODULE – V

Lattice Graphics: The Lattice Package, Creating a Simple Lattice Graph, Lattice Graph Types, Controlling Styles.	4 Hours
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COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Apply the concepts of R programming to read and write data files.	CL3
CO2	Implement the string manipulation and data handling concepts.	CL3
CO3	Illustrate the use of inbuilt functions in the creation and customization of graphs.	CL3
CO4	Apply ggplot2 Package for data visualization.	CL4
CO5	Analyze the lattice graphics and control styles using the lattice package.	CL4

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	1	2				1	1		2		
CO2	3	3	2	1	2				1	1		2		
CO3	3	3	2	1	2	1			1	1		2		
CO4	3	3	2	1	2	1			1	1		2		
CO5	3	3	3	1	2	1			1	1		2		

3: Substantial (High)

2: Moderate (Medium)

1: Poor (Low)

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Laboratory Work (A)	50 %	25
	Laboratory Test (B)	30 %	15
	Open Ended Experiments /Mini Projects (C)	20 %	10
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT STRATEGY:

I. In Laboratory Courses where (B) and (C) are not the components of the assessment pattern, then (A) will have 100% weightage (50 Marks).

Assessment Mode: Weekly Assessment of Laboratory Work (50 Marks) - the marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment, each of 25 marks) of the students in each laboratory session. The average of all the marks obtained across the sessions will be the Final CIA marks.

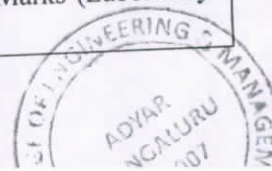
II. In Laboratory Courses where (C) is not a component of the assessment pattern, then (A) will have 50% weightage (25 Marks), and (B) will have 50% weightage (25 Marks).

Assessment Mode: The marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment) (A) and One Laboratory Test (B).

- In Weekly Assessment, the student will be evaluated in each laboratory session for 25 marks. The average marks obtained across all the experiments will be the marks obtained for (A).
- A Laboratory Test, similar to the SEE exam is conducted towards the end of the Semester/Course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B)

The Sum of marks obtained across (A) and (B) will be the Final CIA marks.

III. In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by considering the weightages given above, i.e. (A) – 25 Marks (Weekly Assessment), (B) – 15 Marks (Laboratory Examination), (C) – 10 marks (Open Ended Experiments/Mini Projects)





- The respective course instructor will design the assessment criteria for the said assessment components.
- The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.

In all the cases, the assessments will be done based on the criteria designed by the Course Coordinator.

SEE QUESTION PAPER PATTERN:

1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.
2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

TEXT BOOKS:

1. The art of R programming , by Norman Matloff
2. Sams Teach Yourself R in 24 Hours ,Andy Nicholls, Richard Pugh, Aimee Gott.

REFERENCE BOOKS:

1. Michael J. Crawley, "Statistics: An Introduction using R", Second edition, Wiley,2015
2. R Programming for Data Science Roger D. Peng

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SENSOR SYSTEM AND IOT

(Effective from the Academic Year 2022 - 2023)

IV SEMESTER

Course Code	21CSL483	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	20P	Exam Hours	02

CREDITS – 1

COURSE PREREQUISITES:

- Basic Knowledge of Mathematics and Embedded Systems.

COURSE OBJECTIVES:

- To skill the students in the Internet of Things, gateways, clouds.
- To Skill the students to design the application using IoT enabled Biomedical Sensor.
- To enable the students to design the application using IOT enabled environmental sensor.
- To enable the students to contribute for design of autonomous Vehicles.
- To enable the students to design the Image processing-based application.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

LIST OF EXPERIMENTS

Sl. No.	Description
1	Interfacing Light and Temperature to Arduino/Raspberry Pi/STM32 and upload sensed data to cloud
2	ADC interface to Arduino/Raspberry Pi/STM32 to acquire ECG signal and upload sensed data to mobile
3	Hall effect sensor interface to Arduino/Raspberry Pi/STM32
4	Interfacing LIDAR Unit to Arduino/Raspberry Pi/STM32
5	Interfacing RADAR sensor to Arduino/Raspberry Pi/STM32
6	Interfacing Camera to Arduino/Raspberry Pi/STM32
7	Interfacing Gyro Sensor to Arduino/Raspberry Pi/STM32
8	Interfacing Accelerometers to Arduino/Raspberry Pi/STM32
9	Interfacing humidity and air quality sensor to Arduino/Raspberry Pi/STM32
10	To interface blue tooth with Arduino/Raspberry Pi/STM32 and write a program to send sensor data to smart phone using Bluetooth
11	To interface Zigbee with Arduino/Raspberry Pi/STM32
12	To interface Wi-Fi with Arduino/Raspberry Pi/STM32





COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Demonstrate data logger using Internet, gateways and cloud	CL3
CO2	Interface IOT enabled sensor for Biomedical application	CL3
CO3	Interface IOT enabled sensor for Air quality monitoring	CL3
CO4	Apply Lidar sensor in autonomous vehicle for proximity detection	CL3
CO5	Utilize the camera module to demonstrate image processing applications	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	3	2	2			2		2		
CO2	3	3	2	2	3	2				2		2		
CO3	3	3	2	2	3	2	2	2		2		2		
CO4	3	3	2	2	3					2		2		
CO5	3	3	2	2	3					2		2		

3: Substantial (High)

2: Moderate (Medium)

1: Poor (Low)

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Laboratory Work (A)	50 %	25
	Laboratory Test (B)	30 %	15
	Open Ended Experiments /Mini Projects (C)	20 %	10
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT STRATEGY:

- I. In Laboratory Courses where (B) and (C) are not the components of the assessment pattern, then (A) will have 100% weightage (50 Marks).

Assessment Mode: Weekly Assessment of Laboratory Work (50 Marks) - the marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment, each of 25 marks) of the students in each laboratory session. The average of all the marks obtained across the sessions will be the Final CIA marks.

- II. In Laboratory Courses where (C) is not a component of the assessment pattern, then (A) will have 50% weightage (25 Marks), and (B) will have 50% weightage (25 Marks).

Assessment Mode: The marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment) (A) and One Laboratory Test (B).

- In Weekly Assessment, the student will be evaluated in each laboratory session for 25 marks. The average marks obtained across all the experiments will be the marks obtained for (A).
- A Laboratory Test, similar to the SEE exam is conducted towards the end of the Semester/Course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B)

The Sum of marks obtained across (A) and (B) will be the Final CIA marks.

- III. In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by considering the weightages given above, i.e. (A) – 25 Marks (Weekly Assessment), (B) – 15 Marks (Laboratory Examination), (C) – 10 marks (Open Ended Experiments/Mini Projects)



- The respective course instructor will design the assessment criteria for the said assessment components.
- The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.

In all the cases, the assessments will be done based on the criteria designed by the Course Coordinator.

SEE QUESTION PAPER PATTERN:

1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.
2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

REFERENCE WEB LINKS AND VIDEO LECTURES (E – RESOURCES):

1. <https://www.AUTOSAR.org/standards/>
2. <https://www.comasso.org/>
3. AUTOSAR Architecture (Learn from Scratch with Demo) - <https://www.udemy.com/course/AUTOSAR-architecture/>




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UHV -2 UNDERSTANDING HARMONY and ETHICAL HUMAN CONDUCT

(Effective from the Academic Year 2022 - 2023)

IV SEMESTER

Course Code	21UH49	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	15L	Exam Hours	01

CREDITS – 1

COURSE PREREQUISITES:

- Have/Develop the critical analysis of the day today happenings.

COURSE OBJECTIVES:

This course will enable students to

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

TEACHING - LEARNING STRATEGY:

These are some sample strategies, which course faculty members can incorporate into the Teaching-Learning Process:

- Chalk and Talk Method/Blended Mode Method
- PowerPoint Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem-Based Learning
- Case Studies

COURSE CONTENTS

MODULE - I

Introduction to Value Education:

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education). Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness, and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations.

3 Hours

MODULE - II

Harmony in the Human Being:

Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

3 Hours

MODULE - III

Harmony in the Family and Society:

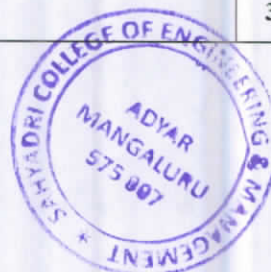
Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationships, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationships, Understanding Harmony in the Society, Vision for the Universal Human Order.

3 Hours

MODULE - IV

Harmony in the Nature/Existence:

3 Hours





Understanding Harmony in Nature, Inter-connectedness, self-regulation, and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence															
MODULE - V															
Implications of the Holistic Understanding – a Look at Professional Ethics:														3 Hours	
Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution, and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems, and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.															
COURSE OUTCOMES															
Upon completion of this course, the students will be able to:															
CO No.	Course Outcome Description													Bloom's Taxonomy Level	
CO1	Understand value education to develop basic human aspirations through a holistic approach													CL2	
CO2	Relate to the needs of self and body to establish co-existence leading to harmony in the human being													CL2	
CO3	Recognize the importance of trust and respect to promote harmony in the family and society													CL2	
CO4	Realize the existence as coexistence to establish harmony through mutual fulfillment among four orders of nature													CL2	
CO5	Recognize the need for a holistic understanding of human values to develop ethical and professional conduct													CL2	
CO-PO-PSO MAPPING															
CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1								1				2			
CO2						1		1	1			2			
CO3						2		1	1			2			
CO4							2	1	1			2			
CO5							1	1				2			
3: Substantial (High)				2: Moderate (Medium)						1: Poor (Low)					
ASSESSMENT STRATEGY															
Assessment will be both CIA and SEE. Student's learning will be assessed using Direct and Indirect methods:															
Sl. No.	Assessment Description						Weightage (%)				Max. Marks				
1	Continuous Internal Assessment (CIA)						100 %				50				
	Continuous Internal Evaluation (CIE)						60 %				30				
	Assignments						40 %				20				
2	Semester End Examination (SEE)						100 %				50				
ASSESSMENT DETAILS															
Continuous Internal Assessment (CIA) (50%)										Semester End Exam (SEE) (50%)					
Continuous Internal Evaluation (CIE) (60%)							Assignment/ Activities (40%)								
I		II		III											
Syllabus Coverage							Syllabus Coverage			Syllabus Coverage					



40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

Theory SEE will be conducted, with common question papers for the subject (**duration 01 hour**)

1. The question paper will have 50 questions. Each question is set for the 01 mark.
2. The students have to answer all the questions, selecting one full question from each module

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Gandhi - Romain Rolland (English)

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://www.aicteindia.org/sites/default/files/Vol.%20II%20%20AICTE%20UG%20%20Curriculum>.
2. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwX_EkQw
3. https://fdp-si.aicte-india.org/8dayUHV_download.php
4. <https://www.youtube.com/watch?v=8ovkLRYXIJE>

Head of the Department
Electronics and Communication Engineering
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Principal

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ADDITIONAL MATHEMATICS-II
(Effective from the Academic Year 2022 - 2023)
IV SEMESTER

Course Code	21MATDIP41	CIA Marks	50
Number of Contact Hours/Week (L: T:P:S)	2:0:0:1	SEE Marks	50
Total Hours of Pedagogy	25L	Exam Hours	03

CREDITS – 0

COURSE PREREQUISITES:

- Basics of Differentiation and Integration, Additional Mathematics I

COURSE OBJECTIVES:

- Enable the students to use the concepts of Vector and Vector Differentiation
- Study the various methods Solving first order first degree Linear Equations.
- Understand the Basic Concept of Partial Differentiation

TEACHING - LEARNING STRATEGY:

These are some sample strategies, which course faculty members can incorporate in the Teaching Learning Process:

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses

COURSE CONTENTS

MODULE - I

Numerical Methods: Finite differences. Interpolation/extrapolation using Newton's forward and backward difference formula, Newton's divided difference and Lagrange's formula (All formulae without proof). Solution of polynomial and transcendental equations-Newton-Raphson and Regula-Falsi methods (only formulae)-illustrative examples. Numerical integration: Simpson's $(1/3)^{th}$ and $(3/8)^{th}$ rules, Weddle's rule (without proof) <i>Text Book 1: Chapter 30(Section 30.4 to 30.9)</i>	5 Hours
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MODULE - II

Linear Algebra: Rank of a matrix-echelon form. Solution of the system of linear equations consistency. Gauss-elimination method, Gauss- Jordan method and Approximate solution by Gauss-Seidel method. Eigenvalues and eigenvectors Rayleigh's power method. Diagonalization of a square matrix of order two. <i>Text Book 1: Chapter 2(Section 2.5 to 2.8)</i>	5 Hours
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MODULE - III

Integral Calculus: Integration of product of two functions using Bernoulli's Rule, Reduction formula – Derivation of Reduction formula of $\cos^n x$ and $\sin^n x$. <i>Text Book 1: Chapter 6(Sections :6.5 to 6.7)</i>	5 Hours
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MODULE - IV

Differential Equations of higher-order: - Second order linear ODEs with constant coefficients-Inverse differential operators	5Hours
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Text Book 2 : (Chapter 8 : Section 8. 4 to 8.7)

MODULE - 5

Laplace Transform: Definition and Laplace transforms elementary functions (statements only). Laplace transforms of Periodic functions and unit-step function. Properties of Laplace transform.

5 Hours

Inverse Laplace Transform: Various Techniques of Inverse Laplace Transform, Convolution Theorem.

Text Book 2: Chapter 21:(Sections: 21.65, 21.68 ,21.69)

COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Understand numerical methods to solve and obtain value of definite integrals.	CL2
CO2	Demonstrate matrix theory to solve system of linear equations and compute Eigenvalues and Eigenvectors.	CL2
CO3	Integrate the product of functions using Bernoulli's Rule.	CL2
CO4	Solve higher-order linear differential equations with constant coefficients.	CL3
CO5	Illustrate the concepts of Laplace and Inverse Laplace Transforms to solve differential equations.	CL2

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2									1	1		
CO2	2	2	1									1			
CO3	2	1	2											1	
CO4	3	2	1									1			
CO5	3	2	1									1			1
3: Substantial (High)				2: Moderate (Medium)						1: Poor (Low)					

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)		
I	II	III			
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage	
40%	30%	30%	100%	100%	
MI			MI	MI	
MII	MII		MII	MII	
	MIII		MIII	MIII	
		MIV	MIV	MIV	
		MV	MV	MV	



Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer **FIVE** full questions, selecting one full question from each module.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. C Ray Wylie, Louis C Barrett: "Advanced Engineering Mathematics", 6th Edition,
2. B.V Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill,
3. H.K.Dass and Er. Rajnish Verma: "Higher Engineering Mathematics" S.Chand Publication (2014).

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

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

Head of the Department
Electronics and Communication Engineering
Sahyadri College of Engineering & Management
An Autonomous Institution



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Sahyadri College of Engineering & Management
Adyar, Mangalore-7
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DATA SCIENCE FOR ENGINEERS
(Effective from the Academic Year 2023 - 2024)
V SEMESTER

Course Code	21IS51	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40L + 20P	Exam Hours	03

CREDITS – 4

PREREQUISITES:

- Fundamental knowledge of mathematical concepts, analytical skills and programming.

COURSE OBJECTIVES:

- Develop relevant programming abilities.
- Demonstrate proficiency with statistical analysis of data.
- Develop the ability to build and assess data-based models.
- Learn to execute statistical analyses.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction: The Ascendance of Data, What Is Data Science? Motivating Hypothetical: Data Science, Visualizing Data, matplotlib, Bar Charts, Line Charts, Scatterplots, Statistics, Describing a Single Set of Data, Correlation, Simpson's Paradox, Some Other Correlational Caveats, Correlation and Causation, Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem.

8 Hours

MODULE - II



Working with data: Hypothesis and Inference, Statistical Hypothesis Testing, Example: Flipping a Coin, p-Values, Confidence Intervals, p-Hacking, Example: Running an A/B Test, Bayesian Inference, Gradient Descent, The Idea Behind Gradient Descent, Estimating the Gradient, Using the Gradient, Choosing the Right Step Size, Using Gradient Descent to Fit Models, Minibatch and Stochastic Gradient Descent, Getting Data, stdin and stdout, Reading Files, Scraping the Web, Using APIs, Example: Using the Twitter APIs, Exploring the Data, Using Named Tuples, Data classes, Cleaning and Munging, Manipulating Data, Rescaling, An Aside: tqdm, Dimensionality Reduction.	8 Hours
MODULE - III	
Machine Learning and Deep Learning: Machine Learning, Modeling, What Is Machine Learning, Overfitting and Underfitting, Correctness, The Bias-Variance Tradeoff, Feature Extraction and Selection, Neural Networks, Perceptrons, Feed-Forward Neural Networks, Backpropagation, Example: Fizz Buzz, Deep Learning, The Tensor, The Layer Abstraction, The Linear Layer, Neural Networks as a Sequence of Layers, Loss and Optimization, Example: XOR Revisited, Other Activation Functions, Example: FizzBuzz Revisited, Softmaxes and Cross-Entropy, Dropout, Saving and Loading Models, Clustering, The Idea, The Model, Example: Meetups, Choosing k, Example: Clustering Colors, Bottom-Up Hierarchical Clustering.	8 Hours
MODULE - IV	
Regression Techniques and Natural Language Processing: Simple Linear Regression, The Model, Using Gradient Descent, Maximum Likelihood Estimation, Multiple Regression, Further Assumptions of the Least Squares Model, Fitting the Model, Interpreting the Model, Goodness of Fit, Digression: The Bootstrap, Standard Errors of Regression Coefficients, Regularization, Logistic Regression, The Problem, The Logistic Function, Applying the Model, Goodness of Fit, Support Vector Machines, Natural Language Processing, Word Clouds, n-Gram Language Models, Grammars, An Aside: Gibbs Sampling, Topic Modeling, Word Vectors, Recurrent Neural Networks, Example: Using a Character-Level RNN.	8 Hours
MODULE - V	
Network Analysis, Recommender System and MapReduce: Betweenness Centrality, Eigenvector Centrality, Directed Graphs and PageRank, Recommender Systems, Manual Curation, Recommending What's Popular, User-Based Collaborative Filtering, Item-Based Collaborative Filtering, Matrix Factorization, Create Table and Insert, Update, Delete, Select, Group By, Order By, Join, Subqueries, Indexes, Query Optimization, NOsql, MapReduce, Example: Word count, Why MapReduce, MapReduce more generally, Example: Analyzing status updates, Example: Matrix multiplication, An Aside: Combiners.	8 Hours
COURSE OUTCOMES	



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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Identify and demonstrate data using visualization tools.	CL3
CO2	Make use of Statistical hypothesis tests to choose the properties of data, curate and manipulate data.	CL3
CO3	Utilize the skills of machine learning algorithms and techniques and develop models.	CL3
CO4	Demonstrate the construction of decision tree and data partition using clustering.	CL3
CO5	Experiment with social network analysis and make use of natural language processing skills to develop data driven applications.	CL3

LABORATORY COMPONENTS

Exp. No.	Experiment Description	CO No.	Bloom's Taxonomy Level
1	Demonstrate all the basic plots using Matplotlib package and python programming.	CO1	CL3
2	Implement a python program to perform File Operations on Excel Dataset.	CO2	CL3
3	Write a python program to perform Array operations using the Numpy package.	CO2	CL3
4	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.	CO3	CL3
5	Demonstrate Linear Regression operation using python programming.	CO4	CL3
6	Train a regularized logistic regression classifier on the in-build iris dataset using scikit-learn. Train the model and report the best classification accuracy.	CO4	CL3
7	Write a python program to perform Data Manipulation operations using Pandas package.	CO4	CL3
8	Develop a MapReduce program to find the grades of students in python.	CO5	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)	Programme Specific Outcome (PSO)
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	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	3						2	2	3	2
CO2	3	3	3	2	3						2	2	3	2
CO3	3	3	3	2	3						2	2	3	2
CO4	3	3	3	2	3						2	2	3	2
CO5	3	3	3	2	3						2	2	3	2
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Practical Session (Laboratory Component)	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)
Continuous Internal Evaluation (CIE) (60%)			Practical Sessions (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII			MII	MII
	MIII		MIII	MIII
	MIV	MIV	MIV	MIV
		MV	MV	MV

NOTE:

- Assessment will be both CIA and SEE.
- The practical sessions of the IPCC shall be for CIE only.
- The Theory component of the IPCC shall be for both CIA and SEE respectively.
- The questions from the practical sessions shall be included in Theory SEE.

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be



assessed through the assignments.

SEE QUESTION PAPER PATTERN:

1. The question paper will have **TEN** full questions from **FIVE** Modules
2. There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
3. Each full question may have a maximum of four sub-questions covering all the topics under a module.
4. The students will have to answer FIVE full questions, selecting one full question from each module.

REFERENCE BOOKS:

1. Joel Grus, Data Science from Scratch-First Principles with Python, O' Reilly Publications, 2nd Edition, 2019, ISBN: 978-9352138326.
2. Emily Robinson, Jacqueline Nolis, Build a Career in Data Science, Manning Publications, 1st Edition, 2020, ISBN: 9781638350156.
3. Aurelien Geron, Hands-on Machine Learning with Scikit-Learn & TensorFlow, O'Reilly Media Publications, 3rd Edition, 2022, ISBN: 978-93-5542-198-2.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. https://onlinecourses.nptel.ac.in/noc21_cs69
2. https://onlinecourses.nptel.ac.in/noc22_cs32



DATA COMMUNICATIONS AND NETWORKS
(Effective from the Academic Year 2023 - 2024)
V SEMESTER

Course Code	21CS52	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40L + 20P	Exam Hours	03

CREDITS – 4

PREREQUISITES:

- Fundamental of data communication and Network Management

COURSE OBJECTIVES:

- Illustrate concepts of data communication, Fundamentals of Physical layer and Data link layer
- Explain routers, IP and Routing Algorithms in network layer
- Discuss transport layer services and understand UDP and TCP protocols
- Demonstration of application layer protocols

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction To Data Communications: Networks, Network Types, Internet History, Standards and administration. OSI and TCP/IP model.	8 Hours
Physical layer: Data and Signals, Periodic Analog signals, Digital Signals, Transmission Impairment, Data Rate limits, Performance, Pulse Code Modulation, Line coding Techniques (NRZ, Manchester, Differential Manchester, AMI, Psedoternary)	

MODULE - II

Data-Link Layer: Introduction to Data-Link Layer, Link-Layer addressing, Error Detection and correction, Block Coding, Cyclic Codes, Checksum.	8 Hours
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Media Access Control: Random Access, Controlled Access, Channelization.		
MODULE - III		
The Network layer - What's Inside a Router?: Switching, Output Processing, Where Does Queuing Occur? IPv6, A Brief foray into IP Security Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing, Routing in the Internet, Intra-AS Routing in the Internet: RIP and OSPF. Inter/AS Routing: BGP, Broadcast Routing Algorithms and Multicast.		8 Hours
MODULE - IV		
Transport Layer - Introduction and Transport-Layer Services: Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing: Connectionless Transport: UDP, UDP Segment Structure, UDP Checksum Principles of Reliable Data Transfer: Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N, Selective repeat Connection-Oriented Transport TCP: The TCP Connection, TCP Segment Structure, Round Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management.		8 Hours
MODULE - V		
Application Layer - Principles of Network Applications: Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols. The Web and HTTP: Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, User-Server Interaction: Cookies, Web Caching, The Conditional GET. File Transfer: FTP Commands & Replies, Electronic Mail in the Internet: SMTP, Comparison with HTTP, Mail Message Format, Mail Access Protocols, DNS. The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages.		8 Hours
COURSE OUTCOMES		
Upon completion of this course, the students will be able to:		
CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Understand the basic fundamentals of data communication and networking	CL2



CO4	3	2	2		2							2	3	2
CO5	3	2	2		2							2	3	2
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Practical Session (Laboratory Component)	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)
Continuous Internal Evaluation (CIE) (60%)			Practical Sessions (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII			MII	MII
	MIII		MIII	MIII
	MIV	MIV	MIV	MIV
		MV	MV	MV

NOTE:

- Assessment will be both CIA and SEE.
- The practical sessions of the IPCC shall be for CIE only.
- The Theory component of the IPCC shall be for both CIA and SEE respectively.
- The questions from the practical sessions shall be included in Theory SEE.

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

SEE QUESTION PAPER PATTERN:

1. The question paper will have **TEN** full questions from **FIVE** Modules
2. There will be 2 full questions from each module. Every question will carry a maximum of 20



marks.

3. Each full question may have a maximum of four sub-questions covering all the topics under a module.
4. The students will have to answer FIVE full questions, selecting one full question from each module.

REFERENCE BOOKS:

1. Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian Edition
2. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson, 2017.
3. Larry L Peterson and Bruce S Davie, Computer Networks, fifth edition, ELSEVIER
4. Andrew S Tanenbaum, Computer Networks, fifth edition, Pearson
5. Mayank Dave, Computer Networks, Second edition, Cengage Learning

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. https://onlinecourses.nptel.ac.in/noc22_cs93/unit?unit=17&lesson=18
2. https://onlinecourses.nptel.ac.in/noc22_cs93/unit?unit=26&lesson=27
3. https://onlinecourses.nptel.ac.in/noc22_cs93/unit?unit=43&lesson=44
4. https://onlinecourses.nptel.ac.in/noc22_cs93/unit?unit=52&lesson=53
5. https://onlinecourses.nptel.ac.in/noc22_cs93/unit?unit=75&lesson=76



AUTOMATA THEORY AND COMPUTABILITY
(Effective from the Academic Year 2023 - 2024)
V SEMESTER

Course Code	21CS53	CIA Marks	50
Number of Contact Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Contact Hours	40L	Exam Hours	03

CREDITS - 3

PREREQUISITES:

- Knowledge of Discrete Mathematics and Data Structures

COURSE OBJECTIVES:

This course will enable students to:

- Outline the need to study formal languages and automata theory and design the finite automata for a given language.
- Write the regular expressions for a given language and the finite automata and examine the properties of regular languages.
- Construct and simplify the context-free grammars and design the pushdown automata for a given language.
- Explore the properties of context-free languages and design the turing machine for a given language.
- Describe the turing machine extensions and examine the decidability of the computational problems.

TEACHING-LEARNING STRATEGY:

Following are some sample strategies that can be incorporated for the Course Delivery:

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem-Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I



Introduction to Automata Theory: Overview and Applications of Automata Theory, The Central Concepts of Automata Theory.	8 Hours
Finite Automata: Deterministic Finite Automata; Nondeterministic Finite Automata, Equivalence of Deterministic and Nondeterministic Finite Automata, An Application of Finite Automata: Text Search, Finite Automata with Epsilon-transitions.	
MODULE - II	
Regular Expressions and Languages: Regular Expressions; Finite Automata and Regular Expressions; Applications of Regular Expressions.	8 Hours
Properties of Regular Languages: Proving Languages Not To Be Regular; Closure Properties of Regular Languages; Equivalence and Minimization of Automata.	
MODULE - III	
Context-Free Grammars and Languages: Context-Free Grammars; Parse Trees; Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.	8 Hours
Pushdown Automata: Definition of the Pushdown Automaton (PDA); The Languages of a PDA; Design of PDA; Equivalence of PDA's and CFG's – Conversion from CFG to PDA and vice versa; Deterministic Pushdown Automata.	
MODULE - IV	
Properties of Context-Free Languages: Normal Forms for Context-Free Grammars; The Pumping Lemma for Context-Free Languages; Closure Properties of Context-Free Languages.	8 Hours
Turing Machine: Turing Machine Model; Representation of Turing Machine, Language Acceptability by Turing Machine, Design of Turing Machines, Techniques for Turing Machine Construction.	
MODULE - V	
Variants of Turing Machines (TM): Nondeterministic Turing Machine, Multi Tape Turing Machine, The Model of Linear Bounded Automaton.	8 Hours
Decidability and Recursively Enumerable Languages: Decidability, Decidable Languages, Undecidable Languages, Halting Problem of Turing Machine, The Post Correspondence Problem.	
Complexity: Growth Rate of Functions, The Classes of P and NP, Quantum Computation - Quantum Computers, Church-Turing Thesis.	
COURSE OUTCOMES	



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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Make use of central concepts of automata theory to solve the finite automata for different formal languages and identify the equivalence between different models of finite automata.	CL3
CO2	Build the regular expression for a given formal language and identify the equivalence between finite automata and regular expressions. Also, explore the properties of regular languages.	CL3
CO3	Construct the context-free grammar and pushdown automata for the different formal languages and also, identify the equivalence between pushdown automata and context-free grammar.	CL3
CO4	Show the properties of context-free languages by simplifying the context-free grammar and build the turing machine for the given formal language.	CL3
CO5	Outline the concepts of turing machine variants and identify the decidability and intractability of computational problems.	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3		2						2	2	1	
CO2	3	3	3	3	2						2	2	2	1
CO3	3	3	3		2						2	2	2	1
CO4	3	3	3	3	2							2	1	
CO5	2	2	2	2								1	1	

3: Substantial (High)

2: Moderate (Medium)

1: Poor (Low)

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Student's learning will be assessed using Direct and Indirect methods.

Sl.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20



2	Semester End Examination (SEE)		100 %	50
ASSESSMENT DETAILS				
Continuous Internal Assessment (CIA) (50%)			Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)		Assignment/ Activities (40%)		
I	II			
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
30%	30%	40%	100%	100%
M I			M I	M I
M II	M II		M II	M II
	M III		M III	M III
		M IV	M IV	M IV
		M V	M V	M V
Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom’s Level. Any COs mapped with higher cognitive Bloom’s Level may also be assessed through the assignments.				
ASSIGNMENT TYPES WITH WEIGHTAGES				
Sl. No.	Assignment Description		Max. Weightage (%)	Max. Marks
1	Written Assignments		25 %	05
2	Quiz		10 %	02
3	Case Studies		25 %	05
4	Seminar/Presentation		15 %	03
5	Peer-to-Peer Learning		10 %	02
6	Activity Based Learning		50 %	10
7	Project Based Learning		50 %	10
8	Field Work + Report		50 %	10
9	Industry Visit + Report		50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions		50 %	10
	NPTEL Certification		75 %	15
11	Any other Innovative Assignments (CL4 and above)		50 %	10
Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands.				



SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules.
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer **FIVE** full questions, selecting one full question from each module.

REFERENCE BOOKS:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman: Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson Education.
2. K L P Mishra, N Chandrasekaran, 3rd Edition, Theory of Computer Science, PHI.
3. Elaine Rich, Automata, Computability and Complexity, 1st Edition, Pearson Education, 2012/2013
4. Michael Sipser: Introduction to the Theory of Computation, 3rd Edition, Cengage Learning, 2013
5. John C Martin, Introduction to Languages and The Theory of Computation, 3rd Edition, Tata McGraw–Hill Publishing Company Limited, 2013
6. Basavaraj S. Anami, Karibasappa K G, Formal Languages and Automata Theory, Wiley India, 2012
7. C K Nagpal, Formal Languages and Automata Theory, Oxford University Press, 2012.

REFERENCE WEB LINKS AND VIDEO LECTURES (E-RESOURCES):

1. <https://nptel.ac.in/courses/106106049>
2. <https://www.jflap.org/>



DATABASE MANAGEMENT SYSTEMS
(Effective from the Academic Year 2023 - 2024)
V SEMESTER

Course Code	21CS54	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

PREREQUISITES:

- Knowledge of Data Structures

COURSE OBJECTIVES:

- Provide a strong foundation in database concepts, technology, and practice.
- Practice SQL programming through a variety of database problems.
- Demonstrate the use of concurrency and transactions in database.
- Design and build database applications for real world problems.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Virtual Lab
- Expert Talk/Webinar/Seminar
- Peer-to-Peer Activities
- Problem Based Learning
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction to Databases: Overview, Characteristics of database approach, Actors on the Scene, Workers behind the Scene, Advantages of using the DBMS approach, History of Database Applications.

Database System Concepts and Architecture: Data Models, Schemas, and Instances, Three schema architecture and data independence, database languages, and interfaces, The Database System environment.

Basic SQL: SQL data definition and data types, specifying constraints in SQL, basic retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL.

8 Hours



MODULE - II

Data Modeling Using the Entity-Relationship (ER) Model: Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, Relationship Types of Degree Higher than Two, Examples.	8 Hours
Relational Database Design by ER-to-Relational Mapping: Relational Database Design using ER-to-Relational mapping.	
The Relational Data Model and Relational Database Constraints: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations.	

MODULE - III

The Relational Algebra: Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional relational operations (aggregate, grouping, etc.), Examples of Queries in relational algebra.	8 Hours
Advanced SQL: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL.	

MODULE - IV

Basics of Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.	8 Hours
Relational Database Design Algorithms and Further Dependencies: Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design.	

MODULE - V

Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, characterizing schedules based on recoverability, characterizing schedules based on Serializability, Transaction support in SQL.	8 Hours
Concurrency Control Techniques: Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering.	
Introduction to NOSQL Databases: Emergence of NOSQL Systems, Characteristics of NOSQL Systems, Categories of NOSQL Systems.	

COURSE OUTCOMES



Upon completion of this course, the students will be able to:														
CO No.	Course Outcome Description												Bloom's Taxonomy Level	
CO1	Discuss the fundamental concepts of database technology and illustrate the fundamental concepts of Structured Query Language (SQL) for database manipulation.												CL3	
CO2	Make use of Entity Relationship (ER) model to illustrate conceptual database design and describe the basic principles of relational model.												CL3	
CO3	Examine the concepts of relational algebra and advanced SQL in database application development.												CL3	
CO4	Apply the functional dependency to measure the appropriateness of attribute groupings into relation schemas and discuss the process of normalization with its algorithms.												CL3	
CO5	Explain the concepts and theory needed for transaction processing, concurrency control in database applications. Describe the NOSQL database with its categories.												CL2	
CO-PO-PSO MAPPING														
CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1									2	1	1
CO2	3	2	1		3							2	1	1
CO3	3	2	1									2	2	1
CO4	3	2	1	1								2	2	1
CO5	3	3	2	2		2				3		2	1	1
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				
ASSESSMENT STRATEGY														
Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:														
Sl. No.	Assessment Description						Weightage (%)				Max. Marks			
1	Continuous Internal Assessment (CIA)						100 %				50			
	Continuous Internal Evaluation (CIE)						60 %				30			
	Assignments						40 %				20			
2	Semester End Examination (SEE)						100 %				50			
ASSESSMENT DETAILS														
Continuous Internal Assessment (CIA) (50%)										Semester End Exam (SEE)				



Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)	(50%)
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII			MII	MII
	MIII		MIII	MIII
	MIV	MIV	MIV	MIV
		MV	MV	MV

Note:

For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: *The assignments mentioned above may be provided appropriately to the students belonging to different bands*

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer **FIVE** full questions, selecting one full question from each module.



REFERENCE BOOKS

1. Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill.
3. Silberschatz Korth and Sudharshan, Database System Concepts, 6th Edition, Mc-Graw Hill, 2013.
4. Coronel, Morris, and Rob, Database Principles Fundamentals of Design, Implementation and Management, Cengage Learning 2012.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. https://www.youtube.com/watch?v=6Iu45VZGQDk&list=PLBlnK6fEyqRi_CUQ-FXxgzKQ1dwr_ZJWZ
2. <https://www.youtube.com/watch?v=IoL9Ve2SRwQ&list=PLIwC9bZ0rmjSkm1VRJROX4vP2YMI4Ebh>
3. <https://www.youtube.com/watch?v=OMwgGL3IHII&list=PLBlnK6fEyqRiYryTrbKHX1Sh9luYI0dhX>
4. https://onlinecourses.nptel.ac.in/noc23_cs41/preview
5. <http://vlabs.iitkgp.ernet.in/se/4/>



DATABASE MANAGEMENT SYSTEMS LABORATORY

(Effective from the Academic Year 2023 - 2024)

V SEMESTER

Course Code	21CSL55	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	20P	Exam Hours	03

CREDITS – 1

PREREQUISITES:

- Basics of SQL

COURSE OBJECTIVES:

- Foundation knowledge in database concepts, technology and practice to groom students into well-informed database application developers.
- Strong practice in SQL programming through a variety of database problems.
- Develop database applications using front-end tools and back-end DBMS.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- PowerPoint Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

LIST OF EXPERIMENTS

Sl. No.	Description
Part-A	
1	Consider the following schema for Bank Database: BRANCH (Branch_id, Bank_name, Branch_name, Assets) ACCOUNT (Acc_no, Branch_id, Account_Type, Account_Balance, Customer_id) CUSTOMER (Customer_id, Customer_name, Customer_age, Customer_address, Customer_phone) LOAN (Loan_number, Branch_id, Amount, Customer_id)



	Note: Account_Type may be of following: Savings, Recurrent, Fixed Deposit Write SQL queries to 1. Find all the Customers who have at least one account at the “Mangaluru” branch. 2. Find names of the depositors who have deposited highest amount among all the customers. 3. Retrieve the Customer name and loan amount of a customer who borrowed a loan more than 5,00,000. 4. Retrieve the details of bank branch with maximum and minimum assets among the various branches. 5. Demonstrate how you delete all account tuples at every branch located in a specific city.
2	Consider the following schema for a Library Database: BOOK(Book_id, Title, Publisher_Name, Pub_Year) BOOK_AUTHORS(Book_id, Author_Name) PUBLISHER(Name, Address, Phone) BOOK_COPIES(Book_id, Programme_id, No-of_Copies) BOOK_LENDING(Book_id, Programme_id, Card_No, Date_Out, Due_Date) LIBRARY_PROGRAMME(Programme_id, Programme_Name, Address) Write SQL queries to 1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each Programme, etc. 2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2023 to Jun 2023. 3. Delete a book in the BOOK table. Update the contents of other tables to reflect this data manipulation operation. 4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query. 5. Create a view of all books and its number of copies that are currently available in the Library
3	Consider the schema for College Database: STUDENT(USN, SName, Address, Phone, Gender) SEMSEC(SSID, Sem, Sec) CLASS(USN, SSID) COURSE(Subcode, Title, Sem, Credits)



IAMARKS (USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)

Write SQL queries to

1. List all the student details studying in the fourth semester „C” section.
2. Compute the total number of male and female students in each semester and in each section.
3. Create a view of Test1 marks of student USN “4SF20CD001” in all Courses.
4. Calculate the FinalIA (average of three test marks) and update the corresponding table for all students.
5. Categorize students based on the following criterion:
If FinalIA = 45 to 50 then CAT = “Outstanding”
If FinalIA= 40 to 45 then CAT= “Good”
If FinalIA = 30 to 40 then CAT = “Average”
If FinalIA< 30 then CAT = “Weak”

Give these details only for 8th semester A, B, and C section students.

Consider the schema for Company Database:

EMPLOYEE (Eid, Name, Address, Gender, Salary, SuperEid, Dno)

DEPARTMENT (Dnum, Dname, DMgr_id, Mgr_start_date)

DLOCATION (Dno, Dlocation)

PROJECT (Pnum, Pname, Plocation, Dno)

WORKS_ON (Eid, Pno, Hours)

DEPENDENT (Empid, Dep_name, Gender, Bdate, Relationship)

Write SQL queries to

4

1. Make a list of all project numbers for projects that involve an employee whose name is “Rahul”, either as a worker or as a manager of the department that controls the project.
2. Show the resulting salaries if every employee working on the “IoT” project is given a 10 percent raise.
3. Find the sum of the salaries of all employees of the “Accounts” department, as well as the maximum salary, the minimum salary, and the average salary in this department.
4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator).
5. Create a view Dept_info that gives details of department name, Number of employees and total salary of each department.



5	Consider the schema for Airline Database: Flights (Flight_num, Source, Destination, Distance, Departs, Arrives, Price) Aircraft (Aid, Aname, Cruising_range) Certified (Emp_id, Aid) Employees (Emp_id, Ename, Salary) Note: The Employees relation describes pilots and other kinds of employees as well; Every pilot is certified for some aircraft, and only pilots are certified to fly. Write SQL queries to 1. Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80, 000. 2. For each pilot who is certified for more than three aircrafts, find the Emp_id and the maximum cruising range of the aircraft for which she or he is certified. 3. Find the names of pilots whose salary is less than the price of the cheapest route from Bengaluru to Mumbai. 4. Find the aids of all aircraft that can be used on routes from Bengaluru to New Delhi. 5. Find the employee name and salary earning the second highest salary.				
Part-B: Mini Project					
• For any societal problem statement selected. • Make sure that the application should have five or more tables, one trigger and one Stored Procedure. • Mobile Applications are strictly prohibited. • The mini project team may consist of a maximum of two members. • The areas for problem statement may include, but not limited to the following : ❖ Educational sector ❖ Environmental issues ❖ Healthcare ❖ Women empowerment ❖ Child care ❖ Banking sector					
COURSE OUTCOMES					
Upon completion of this course, the students will be able to:					
CO No.	<table><tr><th>Course Outcome Description</th><th>Bloom's Taxonomy Level</th></tr><tr><td> </td><td> </td></tr></table>	Course Outcome Description	Bloom's Taxonomy Level		
Course Outcome Description	Bloom's Taxonomy Level				



CO1	Use SQL programming and different concepts of DBMS to create, update and query on the Bank and Library databases.	CL3
CO2	Demonstrate SQL programming and different concepts of DBMS to create, update and query on the College database.	CL3
CO3	Illustrate the concepts of SQL programming and DBMS to create, update and query on the Company database.	CL3
CO4	Create, update and query on the Airline database by using different concepts of DBMS and SQL programming.	CL3
CO5	Design, implement and demonstrate a database application using front end tools and Compile the working with well document using modern tool.	CL6

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	2			1				2	3	2
CO2	3	3	3	2	2			1				2	3	2
CO3	3	3	3	2	2			1				2	3	2
CO4	3	3	3	2	2			1				2	3	2
CO5	3	3	3	2	2			1				2	3	2
CO6	3	3	3	3	3	2		3	3	3	3	2	3	2

3: Substantial (High)

2: Moderate (Medium)

1: Poor (Low)

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Laboratory Work (A)	50 %	25
	Laboratory Test (B)	30 %	15
	Open Ended Experiments /Mini Projects (C)	20 %	10
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT STRATEGY:

I. In Laboratory Courses where (B) and (C) are not the components of the assessment pattern, then (A) will



have 100% weightage (50 Marks).

Assessment Mode: Weekly Assessment of Laboratory Work (50 Marks) - the marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment, each of 25 marks) of the students in each laboratory session. The average of all the marks obtained across the sessions will be the Final CIA marks.

II. In Laboratory Courses where (C) is not a component of the assessment pattern, then (A) will have 50% weightage (25 Marks), and (B) will have 50% weightage (25 Marks).

Assessment Mode: The marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment) (A) and One Laboratory Test (B).

- In Weekly Assessment, the student will be evaluated in each laboratory session for 25 marks. The average marks obtained across all the experiments will be the marks obtained for (A).
- A Laboratory Test, similar to the SEE exam, is conducted towards the end of the semester/course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B)

The Sum of marks obtained across (A) and (B) will be the Final CIA marks.

III. In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by considering the weightages given above, i.e. (A) – 25 Marks (Weekly Assessment), (B) – 15 Marks (Laboratory Examination), (C) – 10 marks (Open Ended Experiments/Mini Projects)

- The respective course instructor will design the assessment criteria for the said assessment components.
- The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.

In all the cases, the assessments will be done based on the criteria designed by the Course Coordinator.

SEE QUESTION PAPER PATTERN:

1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.
2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

REFERENCE WEB LINKS AND VIDEO LECTURES (E – RESOURCES):

1. https://www.youtube.com/watch?v=6Iu45VZGQDk&list=PLBlnK6fEyqRi_CUQ-
2. https://onlinecourses.nptel.ac.in/noc23_cs41/preview
3. <http://vlabs.iitkgp.ernet.in/se/4/>



RESEARCH METHODOLOGY and INTELLECTUAL PROPERTY RIGHTS
(Effective from the Academic Year 2023- 2024)

V SEMESTER

Course Code	21IPR57	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	16L	Exam Hours	01

CREDITS – 1

COURSE PREREQUISITES:

- A foundational understanding of research and knowledge of research problem formulation, familiarity with academic ethics, a basic understanding of statistics and data analysis, ability to search and evaluate academic sources, basic writing and communication skills, critical thinking skills, time management skills and awareness of ethical considerations in research.

COURSE OBJECTIVES:

- Understand the basic concepts, principles, and types of research methodologies
- Collect, analyze, and interpret data using relevant techniques.
- Ethically conduct research and adhere to academic integrity.
- Communicate research findings effectively through written and oral presentations.
- Understand the intellectual property rights and the types of IPR.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporated into the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- PowerPoint Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem-Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction to Research Methodology and Literature Review

Introduction to Research Methodology: Meaning of research, Objectives of research, Types of research, Importance of scientific research in decision making, Defining the research problem, techniques involved in defining a problem. Research Design: Meaning of research design, need for research design, Features of good design.

3 Hours



Literature Review: Significance of literature review, Sources for literature: Books, Journals, Proceedings, Thesis and Dissertations. Online databases: Web of Science, Google and Google Scholar. Quality research papers. Research metrics: Citation, Citation Index, Impact Factor, H-index, i10-index, Google index and their significance.	
MODULE - II	
Data Collection, Analysis and Report Writing Data Collection: Introduction, collection of primary data: observation method, questionnaires and case study method, collection of secondary data, Selection of an appropriate method for data collection. Data Analysis: Introduction, Data analysis process, Types of data analysis, Methods of data analysis: Qualitative analysis, Quantitative analysis. Tools for data analysis. Report Writing: Effective technical writing, Steps for writing a report, structure of the research report, method of writing a research article(manuscript)/ research report, crafting effective project proposals, Paper writing for National and international journals, Submitting papers to journals (Scopus Indexed Journals, Science Citation Indexed journals), preparation of effective slides, pictures, and graphs for presentation.	3 Hours
MODULE - III	
Ethics in Research: Ethics with respect to research, ethical principles, the importance of adhering to ethical norms in research, research misconducts, plagiarism, penalties for plagiarism, publication ethics, conflict of interest, publication misconduct, violation of publication ethics and authorships, identification of publication misconduct, complaints and appeals (examples) and Open Access Publishing.	3 Hours
MODULE - IV	
Intellectual Property Rights, Patents and Industrial Designs: Intellectual Property Rights: Introduction to intellectual property and intellectual property rights, objectives of IPR, History of IPR in India, Role of WIPO and WTO in IPR establishments, Types of Intellectual property rights. Patents: Introduction to patent, need and importance of a patent, requirements of patent, types of patents, few famous examples of patent, patentable and non-patentable items, Duration, limitations of a patent, the Indian Patent Act-1970, Rights associated with patents, Enforcement of patent rights, Patent infringements. Case Studies on Patents: Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, Case study of Basmati patent Industrial Designs: Design introduction, Features of Design, Design law 2000, Registration of Design, Need for registration of Design, Procedure for registration of Design, Infringement of Design.	4 Hours



Famous Case Law: Apple Inc. vs. Samsung Electronics Co.														
MODULE - V														
Copyrights, Trademarks and Geographical Indications: Copyrights: Introduction to copyright, characteristics of copyright, copyright-National Vs international, Indian copyright Act-1957, Indian perspective on copyright, Term/duration of copyright, registration of copyright, copyright symbol, procedure of copyright certification, benefits of copyright registration, copyright infringement, limitations of copyright. Trademarks: Introduction to Trademark, signs which may serve as Trademarks, functions of Trademark, Essential features of Trademark, Types of Trademark, the validity of the trademark, Unfair competition, Trademark Act 1999, Infringement of Trademark, Famous case law: Coca-Cola Company vs. Bisleri International Pvt.Ltd. Geographical Indications: Introduction to G.I, History of G.I, G.I Act 1999, Registration of G.I, Registration process of G.I, Duration of G.I Tag, Infringement of G.I, Some important G.I Tags.													3 Hours	
COURSE OUTCOMES														
Upon completion of this course, the students will be able to:														
CO No.	Course Outcome Description												Bloom's Taxonomy Level	
CO1	Comprehend the process of research methodology to define a research problem.												CL2	
CO2	Understand the analytical tools for the analysis and interpretation of data.												CL2	
CO3	Understand the research ethics and adhere to ethical norms in the research process.												CL2	
CO4	Illustrate the significance of Intellectual property rights and of research projects for economic growth and social benefits.												CL2	
CO5	Demonstrate the copyright laws, subject matters of copyrights and Trademarks.												CL2	
CO-PO-PSO MAPPING														
CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1	1			1		1	1		2			
CO2	3	2	1	1	1	1		1	1		2			
CO3	3	1	1			2		3	1	1	1	2		
CO4	3	2	2	2	1	2		3	1	1	1	2		



CO5	3	2	2	2	1	2		3	1	1	1	2		
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignment	40 %	20
2	Semester End Examination (SEE)	100 %	50

CO - ASSESSMENT MAPPING

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)
Continuous Internal Evaluation (CIE) (60%)			Assignment (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII			MII	MII
	MIII		MIII	MIII
	MIV	MIV	MIV	MIV
		MV	MV	MV

NOTE

- Assessment will be both CIA and SEE.
- The assignment of the IPCC shall be for CIE only.
- The Theory component of the IPCC shall be for both CIA and SEE respectively.

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

SEE QUESTION PAPER PATTERN:

1. The question paper will have TEN full questions from FIVE Modules
2. There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
3. Each full question may have a maximum of four sub-questions covering all the topics under a



module.

4. The students will have to answer FIVE full questions, selecting one full question from each module.

REFERENCE BOOKS:

1. Kothari C R and Gaurav Garg, Research Methodology Methods and Techniques, Fourth Edition by, New Age International, 2019.
2. Ranjit Kumar, Research Methodology- A step by step guide for beginners, Pearson Education, Australia, 2005.
3. Pratim Ray, Partha "A Guide to Research and Publication Ethics" First edition, New Delhi Publishers c2022.
4. Deborah E Bouchoux, Intellectual Property Rights by CENGAGE Learning.
5. Rupinder Tewari and Mamta Bhardwa, Intellectual Property A Primer for Academia.
6. David V. Thiel "Research Methods for Engineers" Cambridge University Press, 978-1-107-03488-4.
7. Catherine J. Holland, "Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets", Entrepreneur Press, 2007.
8. Acharya N K, Intellectual Property Rights, Asia Law House 6th Edition. ISBN: 978-93-81849-30-9

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://nptel.ac.in/courses/106/105/106105077/>
2. <https://youtu.be/oPXyj3mAEKg>
3. <https://youtu.be/E2gGF1rburw>
4. https://www.youtube.com/watch?v=VzIgPfAd0Fs&list=RDCMUCLVol4Vq_9CKVYNv4tDZhXw&start_radio=1&rv=VzIgPfAd0Fs&t=0

Assignments:

1. **Case Study:** Conduct a literature survey on a suitable research topic and prepare a report with a minimum of 10 references that adheres to standard journal specifications.
2. **Case Study:** Download 5 quality research papers published within the last five years from reputed journals on the topic of your choice and provide your analysis and perspective on the chosen topic
3. **Case Study:** Conduct a prior art search using free online databases and prepare a report.



ENVIRONMENTAL STUDIES
(Effective from the Academic Year 2023- 2024)
V SEMESTER

Course Code	21ENV58	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	16L	Exam Hours	01

CREDITS – 1

COURSE PREREQUISITES:

- Fundamental knowledge of Ecosystems, Environment Pollution and its effects.

COURSE OBJECTIVES:

- To create environmental and sustainability awareness among the students.
- To educate the students to understand the various environmental pollutants, waste management techniques, and the legal framework governing environmental protection.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporated into the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- PowerPoint Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem-Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Ecosystem and Sustainability: Structure and Function of ecosystems in Forest, Desert, Wetlands, River, Oceanic and Lakes. Sustainability: 17 SDGs- History, targets, implementation, Capacity Development.
Success stories - Best practices related to ecosystem conservation and sustainable computing and IT practices.

**3
Hours**

MODULE - II



Advances in Energy Systems and Sustainable Practices: Hydrogen, Solar, OTEC, Tidal, and Wind energy systems: Merits and Demerits. Global status and applications of renewable energy sources. Concepts and case studies in disaster management with a focus on technology and data-driven solutions. Sustainable mining practices and their environmental impact. Carbon trading and its role in reducing carbon emissions in the IT industry.		3 Hours
MODULE - III		
Environmental Pollution, Global Issues, and Health Environmental Pollution: Sources, impacts, and control of surface and ground water pollutants. Soil pollutants and their effects on ecosystems. Air pollutants and their consequences on air quality. Radon and fluoride concentration in drinking water and potential health risks. Environmental toxicology - causes and control measures.		4 Hours
MODULE - IV		
E-Waste and Plastic Waste Management Solid waste management: sources, characteristics, health hazards, and disposal methods of E-Waste and Plastic waste. Different approaches of recycling and metal recovery from E-Waste. Role of stake holders in environmental management of e-waste (producers, consumers, recyclers, and statutory bodies). Strategies for plastic pollution control.		3 Hours
MODULE - V		
Sustainable Green Technologies Sustainable agriculture practices and green technologies. Waste-to-Energy Technologies. Introduction to circular economy principles and green data centre technologies in IT sectors. Green certification. Marine conservation.		3 Hours
COURSE OUTCOMES		
Upon completion of this course, the students will be able to:		
CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Summarize the role of IT Engineers in maintaining the ecosystem functionalities and sustainable development in the field of environmental science.	CL2
CO2	Understand the advances in energy systems and approaches relevant to natural resource management.	CL2
CO3	Illustrate the sources, impacts & control of environmental pollution and understand the process involved in sustainable agriculture and marine conservation.	CL2
CO4	Identify the sources of environmental pollution, measures for control and understand the process involved in E-Waste management.	CL2
CO5	Understand the importance of Eco- friendly Technologies in the conservation of	CL2



	biological diversity													
CO-PO-PSO MAPPING														
CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1					2	3	1	2	2		1		
CO2	1					2	3	1	2	2		1		
CO3	1					2	3	1	2	2		1		
CO4	1					2	3	1	2	2		1		
CO5	1					2	3	1	2	2		1		
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				
ASSESSMENT STRATEGY														
Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:														
Sl. No.	Assessment Description					Weightage (%)					Max. Marks			
1	Continuous Internal Assessment (CIA)					100 %					50			
	Continuous Internal Evaluation (CIE)					60 %					30			
	Assignment					40 %					20			
2	Semester End Examination (SEE)					100 %					50			
CO - ASSESSMENT MAPPING														
Continuous Internal Assessment (CIA) (50%)										Semester End Exam (SEE) (50%)				
Continuous Internal Evaluation (CIE) (60%)						Assignment (40%)								
I		II		III										
Syllabus Coverage						Syllabus Coverage				Syllabus Coverage				
40%		30%		30%		100%				100%				
MI						MI				MI				
MII		MII				MII				MII				
		MIII				MIII				MIII				
				MIV		MIV				MIV				
				MV		MV				MV				
Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped														



to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Case Studies	25 %	05
3	Seminar/Presentation	25 %	05
4	Peer - to - Peer Learning	25 %	05

SEE QUESTION PAPER PATTERN:

- The Question paper will have **FIFTY** multiple choice questions covering the entire five module syllabus.
 - Each question may have a maximum of four sub-questions and each question will be for 01 marks.
 - Examination will be **ONLINE** and students will have to answer all the questions.
- The Duration of the Exam will be 01 hours.

REFERENCE BOOKS:

1. Environmental Studies, Benny Joseph, Tata Mc Graw – Hill., 2ndEdition, 2012.
2. Environmental Studies, S M Prakash, Pristine Publishing House, Mangalore, 3rdEdition, 2018.
3. Environmental Studies – From Crisis to Cure, R Rajagopalan, Oxford Publisher, 2005

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

Field work: Visit to Zero Waste Management Plant / Solid waste management plant/Biogas production plant.



MongoDB
(Effective from the Academic Year 2023 - 2024)
V SEMESTER

Course Code	21CS591	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	20P	Exam Hours	02

CREDITS – 1

PREREQUISITES:

- Fundamental knowledge of any programming language
- Basic understanding of any database, SQL, and query language for databases
- Working knowledge of Linux or Unix-based systems (recommended, but not mandatory)

COURSE OBJECTIVES:

- Able to demonstrate a solid understanding of MongoDB fundamentals, including its NoSQL architecture, key features, and the advantages it offers over traditional relational databases.
- Acquire the skills to perform advanced data manipulation using MongoDB, including CRUD operations, indexing strategies, and complex querying techniques.
- Develop practical skills in MongoDB application development, integrating MongoDB with popular programming languages.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

LIST OF EXPERIMENTS

Sl. No.	Description
1	MongoDB installation and configuration in windows.
2	Demonstrate how to create and drop database in MongoDB.
3	Creating the Collection in MongoDB.



4	Creating collection with options before inserting the documents and drop the collection created.
5	MongoDB Insert Document a. Insert single document. b. Insert multiple documents in collection.
6	Querying all the documents in json format and Querying based on the criteria.
7	MongoDB update document a. Using update() method. b. Using save() method.
8	MongoDB delete document from a collection. a. Using remove() method. b. Remove only one document matching your criteria c. Remove all documents.
9	MongoDB Projection
10	limit() ,skip(), sort() methods in MongoDB
11	MongoDB indexing a. Create index in MongoDB b. Finding the indexes in a collection c. Drop indexes in a collection d. Drop all the indexes

COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Demonstrate MongoDB fundamentals, including creating and dropping databases and collections.	CL3
CO2	Demonstrate the significance of document manipulation operations in MongoDB, such as inserting, querying, updating, and deleting documents.	CL3
CO3	Illustrate collections with specific options, project and filter data based on criteria, and perform advanced collection manipulations.	CL3
CO4	Apply limit, skip, and sort methods to demonstrate their ability to control and enhance data retrieval.	CL3
CO5	Demonstrate indexing in MongoDB.	CL3

CO-PO-PSO MAPPING

CO	Programme Outcomes (PO)	Programme
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No.													Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	3		2						1	1	1	1
CO2	3	2	3		2						1	1	1	1
CO3	3	2	3		2						1	1	1	1
CO4	3	2	3		2						1	1	1	1
CO5	3	2	3		2						1	1	1	1
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Laboratory Work (A)	50 %	25
	Laboratory Test (B)	30 %	15
	Open Ended Experiments /Mini Projects (C)	20 %	10
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT STRATEGY:

I. In Laboratory Courses where (B) and (C) are not the components of the assessment pattern, then (A) will have 100% weightage (50 Marks).

Assessment Mode: Weekly Assessment of Laboratory Work (50 Marks) - the marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment, each of 25 marks) of the students in each laboratory session. The average of all the marks obtained across the sessions will be the Final CIA marks.

II. In Laboratory Courses where (C) is not a component of the assessment pattern, then (A) will have 50% weightage (25 Marks), and (B) will have 50% weightage (25 Marks).

Assessment Mode: The marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment) (A) and One Laboratory Test (B).

- In Weekly Assessment, the student will be evaluated in each laboratory session for 25 marks. The average marks obtained across all the experiments will be the marks obtained for (A).
- A Laboratory Test, similar to the SEE exam is conducted towards the end of the Semester/Course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B)



The Sum of marks obtained across (A) and (B) will be the Final CIA marks.

III. In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by considering the weightages given above, i.e. (A) – 25 Marks (Weekly Assessment), (B) – 15 Marks (Laboratory Examination), (C) – 10 marks (Open Ended Experiments/Mini Projects)

- The respective course instructor will design the assessment criteria for the said assessment components.
- The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.

In all the cases, the assessments will be done based on the criteria designed by the Course Coordinator.

SEE QUESTION PAPER PATTERN:

1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.
2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

REFERENCE WEB LINKS AND VIDEO LECTURES (E – RESOURCES):

1. https://www.youtube.com/watch?v=8eJJe4Slnik&ab_channel=Simplilearn
2. https://www.youtube.com/watch?v=ExcRbA7fy_A
3. https://www.youtube.com/watch?app=desktop&v=Www6cTUymCY&ab_channel=Amigoscode
4. <https://www.mongodb.com/docs/manual/tutorial/>



MOBILE APPLICATION DEVELOPMENT
(Effective from the Academic Year 2023 - 2024)
V SEMESTER

Course Code	21CS592	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	20P	Exam Hours	02

CREDITS – 1

PREREQUISITES:

- Basic Knowledge of Java Programming
- Installation procedure of the Android Studio software

COURSE OBJECTIVES:

- Learn and acquire the art of Android Programming.
- Configure Android studio to run the applications.
- Understand and implement Android's User interface functions.
- Inspect different methods of sharing data using services.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

LIST OF EXPERIMENTS

Sl. No.	Description
1a	Create an application to design a Visiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in Capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website address is to be displayed. Insert a horizontal line between the job title and the phone number.
1b	Develop an android application to design a student ID card for the students of a College as per the below requirements. The ID card should have two virtual partitions divided by a horizontal



	divider. In the first partition, the institute logo should be placed at the top aligned to the center. Institute name should be displayed below the logo in capital letters. In the next level the students department must appear in capital letters. The second partition should begin with students photo aligned to the center. Student Name, USN, Phone Number and Address should appear below the photo in a uniform order. Design the UI according to the requirements defined. Also write the corresponding java program.
2	Develop an Android application using controls like Button, Text View, Edit Text for designing a calculator having basic functionality like Addition, Subtraction, Multiplication and Division.
3	Create a SIGN-Up activity with Username and Password. Validation of password should happen based on the following rules: • Minimum length of the password is 8 • Password should contain letters, numbers and special characters. • Password should contain minimum one uppercase letter, lowercase letter, number and special character On successful SIGN UP proceed to the next Login activity. Here the user should SIGN IN using the Username and Password created during signup activity. If the Username and Password are matched then navigate to the next activity which displays a message saying “Successful Login” or else display a toast message saying “Login Failed”. The user is given only two attempts and after that display a toast message saying “Failed Login Attempts” and disable the SIGN IN button. Use Bundle to transfer information from one activity to another.
4	Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 30 seconds.
5	Write a program to create an activity with two buttons START and STOP. On pressing of the START button, the activity must start the counter by displaying the numbers from One and the counter must keep on counting until the STOP button is pressed. Display the counter value in a Text View control.
6	Create two files of XML and JSON type with values for City Name, Latitude, Longitude, Temperature and Humidity. Develop an application to create an activity with two buttons to parse the XML and JSON files which when clicked should display the data in their respective layouts side by side.
7	Develop a simple application with one Edit Text so that the user can write some text in it. Create a button called “Convert Text to Speech” that converts the user input text into voice.
8	Create an activity like a phone dialer with CALL and SAVE buttons. On pressing the CALL button, it must call the phone number and on pressing the SAVE button it must save the number to the phone contacts.



COURSE OUTCOMES														
Upon completion of this course, the students will be able to:														
CO No.	Course Outcome Description												Bloom's Taxonomy Level	
CO1	Demonstrate various Android Applications by setting up Android development environment with necessary virtual devices using Android Virtual Device Manager.												CL3	
CO2	Illustrate process of developing an Android Application for user authentication.												CL3	
CO3	Demonstrate adaptive, responsive user interfaces that work across a wide range of devices and analyse the various APIs used in developing responsive Android Applications												CL3	
CO4	Demonstrate various APIs and methods used for storing, sharing and retrieving data in Android applications.												CL3	
CO5	Examine the different permissions and Security Aspects available for Android applications and discuss its roles in different use cases.												CL3	
CO-PO-PSO MAPPING														
CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	3			3	2			2	2	2
CO2	3	3	3	2	3			3	2			2	2	2
CO3	3	3	3	2	3			3	2			2	2	2
CO4	3	3	3	2	3			3	2			2	2	2
CO5	3	3	3	2	3			3	2			2	2	2
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				
ASSESSMENT STRATEGY														
Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:														
Sl. No.	Assessment Description							Weightage (%)			Max. Marks			
1	Continuous Internal Assessment (CIA)							100 %			50			
	Laboratory Work (A)							50 %			25			
	Laboratory Test (B)							30 %			15			
	Open Ended Experiments /Mini Projects (C)							20 %			10			
2	Semester End Examination (SEE)							100 %			50			



ASSESSMENT STRATEGY:

- I. In Laboratory Courses where (B) and (C) are not the components of the assessment pattern, then (A) will have 100% weightage (50 Marks).
Assessment Mode: Weekly Assessment of Laboratory Work (50 Marks) - the marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment, each of 25 marks) of the students in each laboratory session. The average of all the marks obtained across the sessions will be the Final CIA marks.
- II.
- III. In Laboratory Courses where (C) is not a component of the assessment pattern, then (A) will have 50% weightage (25 Marks), and (B) will have 50% weightage (25 Marks).
Assessment Mode: The marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment) (A) and One Laboratory Test (B).
- In Weekly Assessment, the student will be evaluated in each laboratory session for 25 marks. The average marks obtained across all the experiments will be the marks obtained for (A).
 - A Laboratory Test, similar to the SEE exam is conducted towards the end of the Semester/Course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B). The Sum of marks obtained across (A) and (B) will be the Final CIA marks.
- In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by considering the weightages given above, i.e. (A) – 25 Marks (Weekly Assessment), (B) – 15 Marks (Laboratory Examination), (C) – 10 marks (Open Ended Experiments/Mini Projects)
- The respective course instructor will design the assessment criteria for the said assessment components.
 - The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.

SEE QUESTION PAPER PATTERN:

1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.
2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

REFERENCE WEB LINKS AND VIDEO LECTURES (E – RESOURCES):

1. J. F. DiMarzio, Beginning Android Programming with Android Studio, 4th Edition, 2017.
2. Google Developer Training, "Android Developer Fundamentals Course-Concept Reference", Google Developer Training Team, 2017.
3. <https://www.gitbook.com/book/googledeveloper-training/android-developer-fundamentals-course-concepts/details>.



GAME DEVELOPMENT
(Effective from the Academic Year 2023 - 2024)
V SEMESTER

Course Code	21CS593	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	20P	Exam Hours	02

CREDITS – 1

COURSE PREREQUISITES:

- Basic Knowledge of Mathematics and programming skills.

COURSE OBJECTIVES:

- To install Unity and Unreal engine and become proficient in their GUI for game development.
- Develop the ability to conceptualize and define engaging themes for 2D games.
- To acquire skills in character design, sprite creation, character control and movement to create functional 2D gameplay.
- To design interactive game environments with tiles, interactive objects, and collectibles to enhance player engagement.
- To explore the design of player world interactions, with the option of using physics engines, for immersive
- and dynamic gameplay experiences.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

LIST OF EXPERIMENTS

Sl. No.	Description
1	Installation of a game engine, e.g., Unity, Unreal Engine, familiarization of the GUI. Conceptualize the theme for a 2D game.
2	Character design, sprites, movement and character control.
3	Level design: design of the world in the form of tiles along with interactive and collectible



	objects.													
4	Design of interaction between the player and the world, optionally using the physics engine.													
5	Developing a 2D interactive using Pygame.													
6	Developing a multiplayer experience.													
7	Design of menus and user interaction in mobile platforms.													
8	Developing a 3D Game using Unreal													
9	Developing a Multiplayer game using unity.													
COURSE OUTCOMES														
Upon completion of this course, the students will be able to:														
CO No.	Course Outcome Description	Bloom’s Taxonomy Level												
CO1	Apply game engine expertise to install and navigate game engines like unity and unreal engine.	CL3												
CO2	Create conceptually sound 2D game themes.	CL3												
CO3	Implement 2D game elements by executing their character design, character control, and movement to construct functional game play experiences.	CL3												
CO4	Design interactive game environments through the creation of game worlds using tiles, interactive objects, and collectibles.	CL3												
CO5	Implement 3D environment, animation and behaviour along with physics based and shooter based 3D game mechanics.	CL3												
CO-PO-PSO MAPPING														
CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	3		2							1	1	1
CO2	3	2	3		2							1	1	1
CO3	3	2	3		2							1	1	1
CO4	3	2	3		2							1	1	1
CO5	3	2	3		2							1	1	1
3: Substantial (High)				2: Moderate (Medium)					1: Poor (Low)					
ASSESSMENT STRATEGY														
Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:														



Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Laboratory Work (A)	50 %	25
	Laboratory Test (B)	30 %	15
	Open Ended Experiments /Mini Projects (C)	20 %	10
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT STRATEGY:

- I. In Laboratory Courses where (B) and (C) are not the components of the assessment pattern, then (A) will have 100% weightage (50 Marks).

Assessment Mode: Weekly Assessment of Laboratory Work (50 Marks) - the marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment, each of 25 marks) of the students in each laboratory session. The average of all the marks obtained across the sessions will be the Final CIA marks.

- II. In Laboratory Courses where (C) is not a component of the assessment pattern, then (A) will have 50% weightage (25 Marks), and (B) will have 50% weightage (25 Marks).

Assessment Mode: The marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment) (A) and One Laboratory Test (B).

- In Weekly Assessment, the student will be evaluated in each laboratory session for 25 marks. The average marks obtained across all the experiments will be the marks obtained for (A).
- A Laboratory Test, similar to the SEE exam is conducted towards the end of the Semester/Course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B) The Sum of marks obtained across (A) and (B) will be the Final CIA marks.

- III. In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by considering the weightages given above, i.e. (A) – 25 Marks (Weekly Assessment), (B) – 15 Marks (Laboratory Examination), (C) – 10 marks (Open Ended Experiments/Mini Projects)

- The respective course instructor will design the assessment criteria for the said assessment components.
- The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.

In all the cases, the assessments will be done based on the criteria designed by the Course Coordinator.

SEE QUESTION PAPER PATTERN:

1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.



2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

REFERENCE WEB LINKS AND VIDEO LECTURES (E – RESOURCES):

1. <https://getstream.io/blog/unreal-unity-engine/>
2. <https://logicsimplified.com/newgames/unity3d-vs-unreal-engine-which-game-engine-is-the-best-fit-for-your-game/>



GitHub: AI-Powered Developer Platform
(Effective from the Academic Year 2023 - 2024)

V SEMESTER

Course Code	21CS594	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	20P	Exam Hours	02

CREDITS – 1

PREREQUISITES:

- Basic Knowledge of Programming.

COURSE OBJECTIVES:

- To familiar with basic command of Git
- To create and manage branches
- To understand how to collaborate and work with Remote Repositories
- To familiar with version controlling commands

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Practical Based Learning
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

List of Experiments

Sl. No.	Description
1	Setting Up and Basic Commands Initialize a new Git repository in a directory. Create a new file and add it to the staging area and commit the changes with an appropriate commit message.
2	Creating and Managing Branches a) Create a new branch named "feature-branch." Switch to the "master" branch. Merge the



	"feature-branch" into "master." b) Write the commands to stash your changes, switch branches, and then apply the stashed changes.
3	Collaboration and Remote Repositories a) Clone a remote Git repository to your local machine. b) Fetch the latest changes from a remote repository and rebase your local branch onto the updated remote branch. c) Write the command to merge "feature-branch" into "master" while providing a custom commit message for the merge.
4	Git Tags and Releases Write the command to create a lightweight Git tag named "v1.0" for a commit in your local repository.
5	Advanced Git Operations Write the command to cherry-pick a range of commits from "source-branch" to the current branch.
6	Analysing and Changing Git History a) Given a commit ID, how would you use Git to view the details of that specific commit, including the author, date, and commit message? b) Write the command to list all commits made by the author "JohnDoe" between "2023-01-01" and "2023-12-31." c) Write the command to display the last five commits in the repository's history. d) Write the command to undo the changes introduced by the commit with the ID "abc123".

COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Use the basics commands related to git repository	CL3
CO2	Create and manage the branches	CL3
CO3	Apply commands related to Collaboration and Remote Repositories	CL3
CO4	Use the commands related to Git Tags, Releases and advanced git operations	CL3
CO5	Analyse and change the git history	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)	Programme Specific Outcome (PSO)



	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	3	2	3		3							1	1	1
C02	3	2	3		3							1	1	1
C03	3	2	3		3							1	1	1
C04	3	2	3		3							1	1	1
C05	3	2	3		3							1	1	1
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Laboratory Work (A)	50 %	25
	Laboratory Test (B)	30 %	15
	Open Ended Experiments /Mini Projects (C)	20 %	10
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT STRATEGY:

- I. In Laboratory Courses where (B) and (C) are not the components of the assessment pattern, then (A) will have 100% weightage (50 Marks).

Assessment Mode: Weekly Assessment of Laboratory Work (50 Marks) - the marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment, each of 25 marks) of the students in each laboratory session. The average of all the marks obtained across the sessions will be the Final CIA marks.

- II. In Laboratory Courses where (C) is not a component of the assessment pattern, then (A) will have 50% weightage (25 Marks), and (B) will have 50% weightage (25 Marks).

Assessment Mode: The marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment) (A) and One Laboratory Test (B).

- In Weekly Assessment, the student will be evaluated in each laboratory session for 25 marks. The average marks obtained across all the experiments will be the marks obtained for (A).
- A Laboratory Test, similar to the SEE exam is conducted towards the end of the Semester/Course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B) The Sum of marks obtained across (A) and (B) will be the Final CIA marks.



III. In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by considering the weightages given above, i.e. (A) – 25 Marks (Weekly Assessment), (B) – 15 Marks (Laboratory Examination), (C) – 10 marks (Open Ended Experiments/Mini Projects)

- The respective course instructor will design the assessment criteria for the said assessment components.
- The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.

In all the cases, the assessments will be done based on the criteria designed by the Course Coordinator.

SEE QUESTION PAPER PATTERN:

1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.
2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

REFERENCE WEB LINKS AND VIDEO LECTURES (E – RESOURCES):

- Version Control with Git, 3rd Edition, by Prem Kumar Ponuthurai, Jon Loeliger Released October 2022, Publisher(s): O'Reilly Media, Inc.
- Pro Git book, written by Scott Chacon and Ben Straub and published by Apress, <https://git-scm.com/book/en/v2>
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0130944433473699842782_shared/overview
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01330134712177459211926_shared/overview



SOFTWARE ENGINEERING & PROJECT MANAGEMENT

(Effective from the Academic Year 2023 - 2024)

VI SEMESTER

Course Code	21CS61	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Fundamentals of software Development activities, Management functions.

COURSE OBJECTIVES:

- 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.
- Describe the process of requirement gathering, requirement classification, requirement specification and requirements validation.
- Infer the fundamentals of object-oriented concepts, differentiate system models, use UML diagrams and apply design patterns.
- Explain the role of DevOps in Agile Implementation.
- Discuss various types of software testing practices and software evolution processes.
- Recognize the importance Project Management with its methods and methodologies.
- Identify software quality parameters and quantify software using measurements and metrics. List software quality standards and outline the practices involved

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction: The evolving role of 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.

Process Models: Prescriptive models, Waterfall model, Incremental process models, Evolutionary process models, Specialized process models.

Requirements Engineering: Requirements Engineering Task, Initiating the Requirement

8 Hours



Engineering process, Eliciting Requirements, developing use cases, Building the analysis model, Negotiating Requirements, Validating Requirements, Software Requirement Document (Sec 4.2).Case Tools(Text book 5).		
MODULE - II		
Introduction, Modeling Concepts and Class Modeling: What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modeling history. Modeling as Design technique: Modeling, abstraction, The Three models. Class Modeling: Object and Class Concept, Link and associations concepts, Generalization and Inheritance, A sample class model, Navigation of class models, and UML diagrams Building the Analysis Models: Requirement Analysis, Analysis Model Approaches, Data modeling Concepts, Object Oriented Analysis, Scenario-Based Modeling, Flow-Oriented Modeling, class Based Modeling, Creating a Behavioral Model.		8 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. Agile Methodology: Before Agile – Waterfall, Agile Development.		8 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, Traditional versus Modern Project Management Practices.		8 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, identifying critical path, Activity Float, Shortening Project Duration, Activity on Arrow Networks. 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.		8 Hours
COURSE OUTCOMES		
Upon Completion of this course, the students will be able to:		
CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Understand the activities involved in software engineering and analyze the role of various process models	CL2
CO2	Explain the basics of object-oriented concepts and build a suitable class model using modeling techniques	CL2



CO3	Interpret various software testing methods and to understand the importance of agile methodology.	CL2
CO4	Apply the Concepts of project planning and quality management in software development	CL2
CO5	Illustrate the importance of activity planning and its models	CL2

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	1				1		2	1	1		2	1	1
CO2	2	2	2		2	1		2	2	2	2	2	2	1
CO3	2	2	2		2			2	2	3	1	2	3	1
CO4	2	2	2		2			2	3	3	2	2	3	1
CO5	2	2	2		2	2	2	2	3	3	2	2	3	1
3: Substantial (High)					22: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)		
I	II	III			
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage	
40%	30%	30%	100%	100%	
MI			MI	MI	
MII	MII		MII	MII	
	MIII		MIII	MIII	
		MIV	MIV	MIV	
		MV	MV	MV	

Note:

For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the



appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: *The assignments mentioned above may be provided appropriately to the students belonging to different bands*

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

REFERENCE BOOKS:

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

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. https://onlinecourses.nptel.ac.in/noc20_cs68/preview
2. https://www.youtube.com/watch?v=WxkP5KR_Emk&list=PLrjkTql3jnm9b5nrggx7Pt1G4UAHeFIJ
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)



BIG DATA ANALYTICS
(Effective from the Academic Year 2023- 2024)
SEMESTER - VI

Course Code	21IS62	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 L + 20 P	Exam Hours	03

CREDITS – 4

COURSE PREREQUISITES:

- Fundamental knowledge of database management systems and any programming language.

COURSE OBJECTIVES:

- To understand the need of Big Data, challenges and different analytical architectures
- Installation and understanding of Hadoop Architecture and its ecosystems
- Processing of Big Data with Advanced architectures like Spark.
- Describe graphs and streaming data in Spark.

TEACHING - LEARNING STRATEGY:

These are some sample strategies, which course faculty members can incorporate in the Teaching Learning Process:

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem/Laboratory Based Learning
- Case Studies
- MOOC/NPTEL Courses

COURSE CONTENTS

MODULE - I

Introduction to Big Data Analytics: Big Data, Scalability and Parallel Processing, Designing Data Architecture, Data Sources, Quality, Pre-Processing and Storing, Data Storage and Analysis, Big Data Analytics Applications and Case Studies.

8 Hours

MODULE - II

Introduction to Hadoop: Introduction, Hadoop and its Ecosystem, Hadoop Distributed File System, MapReduce Framework and Programming Model, Hadoop Yarn, Hadoop Ecosystem Tools.

Hadoop Distributed File System Basics: HDFS Design Features, Components, HDFS User Commands. Essential Hadoop Tools.

8 Hours



MODULE - III			
NoSQL Big Data Management, MongoDB and Cassandra: Introduction, NoSQL Data Store, NoSQL Data Architecture Patterns, NoSQL to Manage Big Data, Shared-Nothing Architecture for Big Data Tasks, MongoDB, Databases, Cassandra Databases.			8 Hours
MODULE - IV			
MapReduce , Hive and Pig : Introduction, MapReduce Map Tasks, Reduce Tasks and MapReduce Execution, Composing MapReduce for Calculations and Algorithms, Hive, HiveQL, Pig..			8 Hours
MODULE - V			
Spark and Big Data Analytics: Introduction, Spark, Data Analysis with Spark, Programming using RDD and MLIB, Data ETL, Introduction to Analytics, Reporting and Visualizing.			8 Hours
COURSE OUTCOMES			
Upon completion of this course, the students will be able to:			
CO No.	Course Outcome Description	Bloom’s Taxonomy Level	
CO1	Discuss the fundamental concepts of Big Data analytics with its various applications and overview of data sources, pre-processing and storing.	CL2	
CO2	Summarize the conceptualization of Hadoop and its ecosystem, Hadoop Distributed File system and discuss various essential Hadoop Tools.	CL2	
CO3	Illustrate the concepts and applications of No SQL for Bigdata Analytics using MongoDB and Cassandra.	CL3	
CO4	Demonstrate the Map Reduce programming model to process the big data along with Hadoop tools.	CL3	
CO5	Examine overview and applications of spark used for Bigdata Analytics.	CL3	
LABORATORY CONTENTS			
Exp. No.	Experiment Description	CO No.	Bloom’s Taxonomy Level
1.	Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux. After successful installation on one node, configuration of a multi-node Hadoop cluster (one master and multiple slaves).	CO1	CL2
2.	Write a program to analyze the Web server log stream data using Apache	CO2	CL3



	Flume Framework.		
3.	Write a program to implement MongoDB CRUD operations.	CO3	CL3
4.	Develop a MapReduce program to calculate the frequency of a given word in a given file.	CO4	CL3
5.	Develop a MapReduce program to find the maximum temperature in each year.	CO4	CL3
6.	Develop a MapReduce program to find the grades of students.	CO4	CL3
7.	Write Pig Latin scripts to implement sort, group, join, project and filter the data operations.	CO4	CL3
8.	Use Hive to Create, alter and drop databases, tables, views, functions and Indexes.	CO4	CL3
9.	Implement clustering techniques using SPARK.	CO5	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1		3							2	3	1
CO2	3	2	1	1	3							2	3	1
CO3	3	2	1	2	3							2	3	1
CO4	3	2	1	2	3							2	3	1
CO5	3	3	2	2	3							2	3	1
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

CO - Assessment Mapping:

Course Outcomes	Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)
	Continuous Internal Evaluation (CIE) (60%)			Practical Sessions (40%)	
	I	II	III		
	Syllabus Coverage				
	40%	30%	30%	100%	
CO1	x			x	x
CO2	x			x	x
CO3		x		x	x
CO4		x	x	x	x
CO4			x	x	x



ASSESSMENT STRATEGY:

- Assessment will be both CIA and SEE.
- The practical sessions of the IPCC shall be for CIE only.
- The theory component of the IPCC shall be for both CIA and SEE respectively.
- The questions from the practical sessions may also be included for Theory SEE.

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Practical Sessions (Laboratory Component)	40 %	20
2	Semester End Examination (SEE)	100 %	50

SEE QUESTION PAPER PATTERN:

- The question paper will have TEN full questions from FIVE Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

REFERENCE BOOKS:

1. Raj Kamal and Preeti Saxena, "Big Data Analytics Introduction to Hadoop, Spark, and MachineLearning", McGraw Hill Education, 2018 ISBN: 9789353164966, 9353164966
2. Douglas Eadline, "Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem", 1 stEdition, Pearson Education, 2016. ISBN13: 978- 9332570351
3. Tom White, Hadoop: The Definitive Guide, O'Reilly Media, Inc., Fourth Edition, 2015.
4. Vignesh Prajapati, Big data analytics with R and Hadoop, SPD 2013.
5. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
6. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011
7. Alan Gates, "Programming Pig", O'Reilley, 2011

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. https://onlinecourses.nptel.ac.in/noc20_cs92/



ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

(Effective from the Academic Year 2023 - 2024)

VI SEMESTER

Course Code:	21IS63	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Fundamental knowledge of Mathematics concepts like probability.

COURSE OBJECTIVES:

- To Gain a historical perspective of AI and its foundations
- To understand the basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
- To describe Artificial Intelligence and Machine Learning algorithms and evaluate their performance
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To Illustrate AI and ML algorithm and their use in appropriate applications.
- To Describe the applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models
- To apply the classification, clustering and regression-based machine learning algorithms techniques to solve real time problems.
- To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction to AI: Intelligent systems, Foundations and Sub area of AI, Applications, Tic-Tac-Toe Game playing, Currents trend and developments of AI, General problem solving, Characteristics of problem, Constraint satisfaction.

8 Hours



MODULE - II		
Heuristic search techniques: Generate and Test, Hill Climbing, Best First Search, Problem Reduction. Knowledge representation issues: Representation and Mapping, Approaches to Knowledge Representation.		8 Hours
MODULE - III		
Introduction: Machine Learning, Types of Machine Learning, Main challenges of Machine Learning, Testing and Validating, Performance measures, Concept Learning tasks, Concept Learning as search, Find S algorithm, Version Spaces and Candidate Elimination algorithm. Decision Tree Learning: Introduction, Decision tree representation, Appropriate problems, ID3 algorithm.		8 Hours
MODULE - IV		
Artificial Neural Network: Introduction, NN representation, Appropriate problems, Perceptron, Back propagation algorithm. Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naive Bayes Classifier, Bayesian Belief Network (BBN).		8 Hours
MODULE - V		
Unsupervised Learning Techniques: Clustering algorithms: K-Means. Instance-Base Learning: Introduction, k-Nearest Neighbor Learning, Locally Weighted Regression, Linear SVM classification, Nonlinear SVM classification, SVM Regression. Reinforcement Learning: Introduction, The learning task, Q-Learning.		8 Hours
COURSE OUTCOMES		
Upon completion of this course, the students will be able to:		
CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Illustrate the theory of artificial intelligence for various problem-solving techniques.	CL3
CO2	Apply artificial intelligence concepts in Heuristic Search Techniques and knowledge representation.	CL3
CO3	Demonstrate the ability to evaluate concept learning tasks and decision tree algorithms to solve classification problems.	CL3
CO4	Apply the concept of neural networks for learning linear and non-linear activation functions and Bayesian classifier to label data.	CL3
CO5	Illustrate clustering, instant based and reinforcement learning algorithms and identify its applicability in real life problems.	CL3



CO-PO-PSO MAPPING															
CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	3	3	1						1	1	2	1	2	2	
CO2	3	3	1						1	1	2	1	2	2	
CO3	3	3	1						1	1	2	1	2	2	
CO4	3	3	1						1	1	2	1	2	2	
CO5	3	3	1						1	1	2	1	2	2	
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)					
ASSESSMENT STRATEGY Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:															
Sl. No.	Assessment Description							Weightage (%)			Max. Marks				
1	Continuous Internal Assessment (CIA)							100 %			50				
	Continuous Internal Evaluation (CIE)							60 %			30				
	Assignments							40 %			20				
2	Semester End Examination (SEE)							100 %			50				
ASSESSMENT DETAILS															
Continuous Internal Assessment (CIA) (50%)									Semester End Exam (SEE) (50%)						
Continuous Internal Evaluation (CIE) (60%)							Assignment/ Activities (40%)								
I		II		III											
Syllabus Coverage							Syllabus Coverage			Syllabus Coverage					
40%		30%		30%			100%			100%					
MI							MI			MI					
MII		MII					MII			MII					
		MIII					MIII			MIII					
				MIV			MIV			MIV					
				MV			MV			MV					
<i>Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.</i>															
ASSIGNMENT TYPES WITH WEIGHTAGES															
Sl. No.	Assignment Description								Max. Weightage (%)			Max. Marks			



1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

REFERENCE BOOKS:

1. Elaine Rich, Kevin KandSBNair, “**Artificial Intelligence**”, 3rd Edition, McGrawHill Education, 2017
2. Aurelien Geron, Hands-on Machine Learning with Scikit-Learn & TensorFlow, O'Reilly Media Publications, 3rd Edition, 2022, ISBN: 978-93-5542-198-2
3. Tom M Mitchell, “**Machine Learning**”, 1st Edition, McGrawHill Education, 2017.
4. Saroj Kaushik, Artificial Intelligence, Cengage learning
5. Stuart Rusell, Peter Norving, Artificial Intelligence: A Modern Approach, Pearson Education 2nd Edition
6. Aur Èlien GÈron, "Hands-On Machine Learning with Scikit Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, Shroff/O'Reilly Media, 2017.
7. Trevor Hastie, Robert Tibshirani, Jerome Friedmanh The Elements of Statistical Learning, 2nd edition, springer series in statistics.
8. Ethem Alpaydın, Introduction To machine learning, second edition, MIT press
9. Srinivasa K G and Sridhar, “Artificial Intelligence and Machine Learning”, Cengage

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://www.youtube.com/watch?v=wnqkfpCpK1g>
2. <https://www.youtube.com/watch?v=t4K6lney7Zw>
3. <https://www.youtube.com/watch?v=VOaoabf3LPM>



INFORMATION STORAGE MANAGEMENT
(Effective from the Academic Year 2023 - 2024)
VI SEMESTER

Course Code	21IS641	CIA Marks	50
Number of Contact Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Contact Hours	40	Exam Hours	03

CREDITS - 3

Prerequisites:

- Knowledge of Data Communication, Database Management System and Data Warehousing

Course Objectives:

This course will enable students to:

- Describe the importance of data, information, and storage infrastructure.
- Review the evolution of storage technology.
- Understand the key management requirements of a storage system.
- Introduce RAID and intelligent storage systems.
- Explain the storage networking technologies and virtualization.
- Discuss CAS, business continuity, backup and recovery.

Teaching-Learning Strategy:

Following are some sample strategies that can be incorporated for the Course Delivery:

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem-Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction to Information Storage: Information Storage, Evolution of Storage Architecture, Data Center Infrastructure, Virtualization and Cloud Computing.

Data Center Environment: Application, Database Management System (DBMS), Host (Compute), Connectivity, Storage, Disk Drive Components, Disk Drive Performance, Host Access to Data, Direct-Attached Storage, Storage Design Based on Application Requirements

8 Hours



and Disk Performance.		
MODULE - II		
Data Protection: RAID - RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID Comparison, Hot Spares. Intelligent Storage Systems: Components of an Intelligent Storage System, Storage Provisioning, Types of Intelligent Storage Systems.		8 Hours
MODULE - III		
Fibre Channel Storage Area Networks - Fibre Channel: Overview, The SAN and Its Evolution, Components of FC SAN, FC Connectivity, Switched Fabric Ports, Fibre Channel Architecture, Fabric Services, Switched Fabric Login Types, Zoning, FC SAN Topologies. Network-Attached Storage (NAS): General-Purpose Servers versus NAS Devices, Benefits of NAS, File Systems and Network File Sharing, Components of NAS, NAS I/O Operation, NAS Implementations, NAS File-Sharing Protocols, Factors Affecting NAS Performance, File Level Virtualization.		8 Hours
MODULE - IV		
Introduction to Business Continuity: Information Availability, BC Terminology, BC Planning Life Cycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions. Backup and Archive: Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments, Backup Targets, Data Archive, Archiving Solution Architecture.		8 Hours
MODULE - V		
Local Replication: Replication Terminology, Uses of Local Replicas, Replica Consistency, Local Replication Technologies, Tracking Changes to Source and Replica, Restore and Restart Considerations, Creating Multiple Replicas. Remote Replication: Modes of Remote Replication, Remote Replication Technologies, Three Site Replication, Data Migration Solutions.		8 Hours
COURSE OUTCOMES		
Upon completion of this course, the students will be able to:		
CO No.	Course Outcome Description	Bloom's Taxonomy Level



CO1	Describe the evolution of information storage architecture and data center environment. Also identify the storage requirements for the applications.	CL3
CO2	Explain the importance of RAID and an intelligent storage system for the effective maintenance and protection of data. Also, identify the disk load in different types of RAID.	CL3
CO3	Discuss the different storage networking technologies including FC SAN and NAS.	CL2
CO4	Explain the process of business continuity, backup, and recovery to ensure information availability for vital business operations.	CL2
CO5	Explain the process of replication to minimize the risk of business disruption and ensure business continuity.	CL2

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2									2	1	
CO2	3	3	2		2							2	1	1
CO3	3	3	3		2							2	1	
CO4	3	3	3		2							2	1	
CO5	3	3	3									2	1	1
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Student's learning will be assessed using Direct and Indirect methods.

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage



40%	30%	30%	100%	100%
M I			M I	M I
M II			M II	M II
	M III		M III	M III
	M IV	M IV	M IV	M IV
		M V	M V	M V

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer-to-Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands.

SEE Question Paper Pattern:

- The question paper will have **TEN** full questions from **FIVE** Modules.
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.



Text Books:

1. Somasundaram Gnanasundaram, Alok Shrivastava: “Information Storage and Management”, 2nd Edition, EMC Education Services, Wiley India Publications. ISBN: 978-81-265-3750-1
2. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2003.
3. Robert Spalding: Storage Networks, The Complete Reference, Tata McGraw Hill, 2003.
4. Richard Barker and Paul Massiglia: Storage Area Networks Essentials A Complete Guide to Understanding and Implementing SANs, Wiley India, 2002.

Reference Web Links And Video Lectures (E-Resources):

1. <https://nptel.ac.in/courses/106108058>



INDUSTRIAL IOT & ANALYTICS
(Effective from the Academic Year 2022 - 2023)
VI SEMESTER

Course Code	21IS642	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Fundamental knowledge of Industrial IOT Systems.

COURSE OBJECTIVES:

- To provide students with good depth of knowledge of Designing Industrial IOT Systems for various application.
- Knowledge for the design and analysis of Industry 4.0 Systems.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction to Industrial IoT (IIoT) Systems: The Various Industrial Revolutions, Role of Internet of Things (IoT) & Industrial Internet of Things (IIoT) in Industry, Industry 4.0 revolutions, Support System for Industry 4.0, Smart Factories.	8 Hours
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MODULE - II

Implementation systems for IIoT: Sensors and Actuators for Industrial Processes, Sensor networks, Process automation and Data Acquisitions on IoT Platform, Microcontrollers and Embedded PC roles in IIoT, Wireless Sensor nodes with Bluetooth, WiFi, and LoRa Protocols and IoT Hub systems.	8 Hours
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MODULE - III

IIoT Data Analytics: IoT Gate way, IoT Edge Systems and It's Programming, Cloud computing, Real Time Dashboard for Data Monitoring, Data Analytics and Predictive Maintenance with IIoT technology.	8 Hours
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MODULE - IV														
Cyber Physical Systems: Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis													8 Hours	
MODULE - V														
Industrial IoT- Applications: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management.													8 Hours	
COURSE OUTCOMES														
Upon completion of this course, the students will be able to:														
CO No.	Course Outcome Description												Bloom's Taxonomy Level	
CO1	Knowledge of theory and practice related to Industrial IoT Systems.												CL2	
CO2	Ability to identify, formulate and solve engineering problems by using Industrial IoT.												CL3	
CO3	Analyze data Analytics for Industrial Internet of Things												CL3	
CO4	Demonstrate Cyber Physical systems.												CL3	
CO5	Ability to implement real field problem by gained knowledge of Industrial applications with IoT capability.												CL4	
CO-PO-PSO MAPPING														
CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	1											1	1
CO2	2	1	3										1	1
CO3	2	1	3				2						1	1
CO4	2	1					2						1	1
CO5	2	1											1	1
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				
ASSESSMENT STRATEGY														
Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:														
Sl. No.	Assessment Description						Weightage (%)			Max. Marks				
1	Continuous Internal Assessment (CIA)						100 %			50				
	Continuous Internal Evaluation (CIE)						60 %			30				
	Assignments						40 %			20				
2	Semester End Examination (SEE)						100 %			50				
ASSESSMENT DETAILS														
Continuous Internal Assessment (CIA) (50%)										Semester End Exam (SEE)				



Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)	(50%)
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

TEXT BOOKS:

1. Industry 4.0: The Industrial Internet of Things Alasdair Gilchrist Publications.
2. Dr. OvidiuVermesan, Dr. Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers.
3. Embedded System: Architecture, Programming and Design by Rajkamal, TMH3.



REFERENCE BOOKS:

1. The Concept Industry 4.0 “An Empirical Analysis of Technologies and Applications in Production Logistics” Authors: Bartodziej, Christoph Jan Springer: Publication in the field of economic science.
2. The Internet of Things: Key Applications and Protocols, ISBN: 978-1-119-99435-0, 2nd Edition, Willy Publications.
3. Internet of Things- From Research and Innovation to Market Deployment; By Ovidiu & Peter; River Publishers Series.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://www.cisco.com/c/en/us/solutions/internet-of-things>
2. <https://www.tibco.com/reference-center/what-is-iiot>



SOCIAL NETWORK ANALYSIS
(Effective from the Academic Year 2022 - 2023)
VI SEMESTER

Course Code	21CS643	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Fundamental knowledge of Mathematics, Data Structures and algorithms.

COURSE OBJECTIVES:

- To develop semantic web related applications.
- To represent knowledge using ontology.
- To predict human behavior in social web and related communities.
- To visualize social networks.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction - Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.	8 Hours
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MODULE - II

Modelling, aggregating and knowledge representation: Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.	8 Hours
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MODULE - III



Extraction and mining communities in web social networks: Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities.	8 Hours
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MODULE - IV

Predicting human behaviour and privacy issues: Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.	8 Hours
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MODULE - V

Visualization and applications of social networks: Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.	8 Hours
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COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Understand the evolution and significance of web technologies and social network analysis.	CL2
CO2	Apply ontological representations to enhance social network data aggregation and reasoning.	CL3
CO3	Implement community mining algorithms to discover and analyse social network communities.	CL3
CO4	Demonstrate proficiency in managing user data responsibly and securely, considering ethical and legal considerations in data handling and storage.	CL3
CO5	Apply various visualization techniques to analyse and solve real world problems using social network data.	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	1				2				2		
CO2	3	3	2					2				2		
CO3	3	3	3					2				2		
CO4	3	3	3					2				2		



CO5	3	3	3				2				2		
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)			
ASSESSMENT STRATEGY													
Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:													
Sl. No.	Assessment Description				Weightage (%)				Max. Marks				
1	Continuous Internal Assessment (CIA)				100 %				50				
	Continuous Internal Evaluation (CIE)				60 %				30				
	Assignments				40 %				20				
2	Semester End Examination (SEE)				100 %				50				
ASSESSMENT DETAILS													
Continuous Internal Assessment (CIA) (50%)									Semester End Exam (SEE) (50%)				
Continuous Internal Evaluation (CIE) (60%)						Assignment/ Activities (40%)							
I		II		III									
Syllabus Coverage						Syllabus Coverage			Syllabus Coverage				
40%		30%		30%		100%			100%				
MI						MI			MI				
MII		MII				MII			MII				
		MIII				MIII			MIII				
				MIV		MIV			MIV				
				MV		MV			MV				
Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom’s Level. Any COs mapped with higher cognitive Bloom’s Level may also be assessed through the assignments.													
ASSIGNMENT TYPES WITH WEIGHTAGES													
Sl. No.	Assignment Description								Max. Weightage (%)			Max. Marks	
1	Written Assignments								25 %			05	
2	Quiz								10 %			02	
3	Case Studies								25 %			05	
4	Seminar/Presentation								15 %			03	
5	Peer - to - Peer Learning								10 %			02	
6	Activity Based Learning								50 %			10	
7	Project Based Learning								50 %			10	
8	Field Work + Report								50 %			10	
9	Industry Visit + Report								50 %			10	
10	NPTEL/MOOC Courses – Registration and Assignment Submissions								50 %			10	
	NPTEL Certification								75 %			15	
11	Any other Innovative Assignments (CL4 and above)								50 %			10	



Note: *The assignments mentioned above may be provided appropriately to the students belonging to different bands*

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

TEXT BOOKS:

1. Peter Mika, —Social Networks and the Semantic Web, First Edition, Springer 2007.
2. Borko Furht, —Handbook of Social Network Technologies and Applications, 1st Edition, Springer, 2010.

REFERENCE BOOKS:

1. Guandong Xu ,Yanchun Zhang and Lin Li, —Web Mining and Social Networking – Techniques and applications, First Edition, Springer, 2011.
2. Dion Goh and Schubert Foo, —Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, —Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling, IGI Global Snippet, 2009.
4. John G. Breslin, Alexander Passant and Stefan Decker, —The Social Semantic Web, Springer, 2009.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. https://onlinecourses.nptel.ac.in/noc22_cs117/preview



DRONE TECHNOLOGY AND APPLICATIONS
(Effective from the Academic Year 2023 - 2024)
VI SEMESTER

Course Code	21IS644	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Fundamental knowledge of Drone technology.

COURSE OBJECTIVES:

- To understand the basics of drone concepts.
- To learn and understand the fundamentals of design, fabrication and programming of drone.
- To impart the knowledge of a flying and operation of drone.
- To know about the various applications of drone.
- To understand the safety risks and guidelines of fly safely.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction to Drone Technology: Drone Concept, Vocabulary Terminology, History of drone, Types of current generation of drones based on their method of propulsion, Drone technology impact on the businesses, Drone business through entrepreneurship, Opportunities/applications for entrepreneurship and employability.

8 Hours

MODULE - II

Drone Design, Fabrication and Processing: Classifications of the UAV , Overview of the main drone parts, Technical characteristics of the parts, Function of the component parts, Assembling a drone, The energy sources, Level of autonomy, Drones configurations , The methods of programming drone, Download program, Install program on computer, Running Programs, Multi rotor stabilization, Flight modes, Wi-Fi connection.

8 Hours



MODULE - III	
Drone Flying and Operation: Concept of operation for drone, Flight modes, Operate a small drone in a controlled environment, Drone controls Flight operations, management tool, Sensors, Onboard storage capacity, Removable storage devices, Linked mobile devices and applications.	8 Hours

MODULE - IV	
Drone Commercial Application: Choosing a drone based on the application, Drones in the insurance sector, Drones in delivering mail, parcels and other cargo, Drones in agriculture, Drones in inspection of transmission lines and power distribution, Drones in filming and panoramic picturing.	8 Hours

MODULE - V	
Future Drones and Safety: The safety risks, Guidelines to fly safely, Specific aviation regulation and standardization, Drone license, Miniaturization of drones, Increasing autonomy of drones, The use of drones in swarms.	8 Hours

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Know about a various type of drone technology, drone fabrication and programming.	CL2
CO2	Execute the suitable operating procedures for functioning a drone.	CL3
CO3	Select appropriate sensors and actuators for Drones	CL3
CO4	Develop a drone mechanism for specific applications.	CL3
CO5	Create the programs for various drones	CL4

CO-PO-PSO MAPPING														
CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	1											1	1
CO2	2	1				2							1	1
CO3	2	1				2							1	1
CO4	2	1				1							1	1
CO5	2	1											1	1
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect	
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methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)			Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)		Assignment/ Activities (40%)		
I	II			III
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules



- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

TEXT BOOKS:

1. Daniel Tal and John Altschuld, “Drone Technology in Architecture, Engineering and Construction: A Strategic Guide to Unmanned Aerial Vehicle Operation and Implementation”, 2021 John Wiley & Sons, Inc.
2. Terry Kilby and Belinda Kilby, “Make:Getting Started with Drones “,Maker Media, Inc, 2016

REFERENCE BOOKS:

1. John Baichtal, “Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs”, Que Publishing, 2016
2. Završnik, “Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance”, Springer, 2018.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://www.dronedeploy.com/resources>
2. <https://www.techtarget.com/iotagenda/definition/drone>



BLOCKCHAIN AND APPLICATIONS
(Effective from the Academic Year 2022 - 2023)
VI SEMESTER

Course Code:	21CS651	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Fundamental knowledge of Mathematics, Data Structures, Cryptography

COURSE OBJECTIVES:

-

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction to Blockchain Technology,Distributed systems , The history of blockchain , CAP theorem and blockchain, Benefits and limitations of blockchain, Decentralization using blockchain , Methods of decentralization, Routes to decentralization.	8 Hours
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MODULE - II

Cryptography in Blockchain: Introduction, cryptographic primitives, Asymmetric cryptography,public and private keys ,RSA, ECC , Hashfuctions, financial markets and trading	8 Hours
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MODULE - III

Bit Coin Introduction, Transactions :Structure ,Transactions types , The structure of a block, The genesis block , The bitcoin network, Wallets and its types, Bitcoin payments, Bitcoin investment and buying and selling bitcoins, Bitcoin installation , Bitcoin programming and the command-line interface , Bitcoin improvement proposals (BIPs).	8 Hours
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3: Substantial (High)			2: Moderate (Medium)		1: Poor (Low)	
ASSESSMENT STRATEGY						
Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:						
Sl. No.	Assessment Description			Weightage (%)		Max. Marks
1	Continuous Internal Assessment (CIA)			100 %		50
	Continuous Internal Evaluation (CIE)			60 %		30
	Assignments			40 %		20
2	Semester End Examination (SEE)			100 %		50
ASSESSMENT DETAILS						
Continuous Internal Assessment (CIA) (50%)					Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)			
I	II	III				
Syllabus Coverage			Syllabus Coverage		Syllabus Coverage	
40%	30%	30%	100%		100%	
MI			MI		MI	
MII	MII		MII		MII	
	MIII		MIII		MIII	
		MIV	MIV		MIV	
		MV	MV		MV	
Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom’s Level. Any COs mapped with higher cognitive Bloom’s Level may also be assessed through the assignments.						
ASSIGNMENT TYPES WITH WEIGHTAGES						
Sl. No.	Assignment Description			Max. Weightage (%)		Max. Marks
1	Written Assignments			25 %		05
2	Quiz			10 %		02
3	Case Studies			25 %		05
4	Seminar/Presentation			15 %		03
5	Peer - to - Peer Learning			10 %		02
6	Activity Based Learning			50 %		10
7	Project Based Learning			50 %		10
8	Field Work + Report			50 %		10
9	Industry Visit + Report			50 %		10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions			50 %		10



	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

TEXT BOOKS:

1. Bashir, Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition, 2nd Revised edition. Birmingham: Packt Publishing, 2018.

REFERENCE BOOKS:

1. A. M. Antonopoulos, Mastering bitcoin, First edition. Sebastopol CA: O'Reilly, 2015.
2. Z. Zheng, S. Xie, H. Dai, X. Chen, and H. Wang, —An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends in 2017 IEEE International Congress on Big Data (Bigdata Congress), 2017, pp.557–564

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://ethereum.org/en/>
2. <https://www.blockchain.com/explorer>



COMPUTER VISION
(Effective from the Academic Year 2024 - 2025)
VI SEMESTER

Course Code	21IS652	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Fundamental knowledge of Image Processing.

COURSE OBJECTIVES:

- To understand the fundamental concepts related to Image formation and processing.
- To learn feature detection, matching and detection
- To become familiar with feature based alignment and motion estimation.
- To develop skills on 3D reconstruction.
- To understand image based rendering and recognition

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction to Image Formation and Processing: Computer Vision - Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighbourhood operators - Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization.

8 Hours

MODULE - II

Feature Detection, Matching and Segmentation: Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge - Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods.

8 Hours

MODULE - III



Feature Based Alignment and Motion Estimation: 2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration - Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment - Constrained structure and motion - Translational alignment - Parametric motion - Spline-based motion - Optical flow - Layered motion.													8 Hours	
MODULE - IV														
3D Reconstruction: Shape from X - Active range finding - Surface representations - Point-based representations- Volumetric representations - Model-based reconstruction - Recovering texture maps.													8 Hours	
MODULE - V														
Image- Based Rendering and Recognition: View interpolation Layered depth images - Light fields and Lumigraphs - Environment mattes - Video-based rendering-Object detection - Face recognition - Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets.													8 Hours	
COURSE OUTCOMES														
Upon completion of this course, the students will be able to:														
CO No.	Course Outcome Description												Bloom's Taxonomy Level	
CO1	To understand basic knowledge, theories and methods in image processing and computer vision.												CL2	
CO2	To implement basic and some advanced image processing techniques in Open CV.												CL3	
CO3	To apply 2D a feature-based based image alignment, segmentation and motion estimations.												CL3	
CO4	To apply 3D image reconstruction techniques.												CL3	
CO5	To design and develop innovative image processing and computer vision applications.												CL4	
CO-PO-PSO MAPPING														
CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1	1	1	1				2	1	3	2	2	1
CO2	3	3	3	2	3		1		2	1	2	2	3	1
CO3	3	3	2	2	3				1	1	2	2	3	2
CO4	2	3	3	2	3				2	1	2	3	2	2
CO5	2	3	3	2	2	2			3	1	2	3	3	3
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				
ASSESSMENT STRATEGY														
Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:														
Sl.	Assessment Description							Weightage (%)			Max. Marks			



No.			
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer **FIVE** full questions, selecting one full question from each module.



TEXT BOOKS:

1. Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer- Texts in Computer Science, Second Edition, 2022.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015.

REFERENCE BOOKS:

1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
2. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006.
3. E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://opencv.org/opencv-free-course/>
2. [https:// docs.opencv.org](https://docs.opencv.org)



CRYPTOGRAPHY AND NETWORK SECURITY
(Effective from the Academic Year 2023 – 2024)
VI SEMESTER

Course Code	21IS653	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Fundamental knowledge of Cryptography Theories and Network security.

COURSE OBJECTIVES:

- This course is aimed at providing students with a practical and theoretical knowledge of cryptography and network security.
- To develop an understanding of different cryptographic protocols and techniques.
- To understand methods for authentication, access control, intrusion detection and prevention.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction to Network Security: Introduction - Need for Security, Security Approaches, Principles of Security, Security services, Types of Attacks – General View - Technical View, Programs that Attack, Specific Attacks.

8 Hours

MODULE - II

Basics of Cryptography and Encryption: Introduction to Cryptography, Plain Text and Cipher Text, Symmetric Cipher Model, Cryptography, Cryptanalysis, Brute Force Attacks, Substitution Techniques - Caesar Cipher and Modified Caesar Cipher, Mono Alphabetic cipher, Poly-Alphabetic Cipher, Playfair Cipher, Transposition Techniques- Rail Fence technique, Simple Columnar transposition Technique.

8 Hours

MODULE - III



Block ciphers and Data encryption standards: Stream ciphers Block ciphers, Data Encryption Standard, a DES example, AES- structure, AES transformation functions.													8 Hours	
MODULE - IV														
Public key cryptography and RSA: Principles of public key cryptosystems - public key cryptosystems - applications for public key cryptosystems, RSA algorithm - algorithm and example.													8 Hours	
Cryptographic Data integrity algorithms - Cryptographic Hash functions - applications, Message Authentication – Requirements and Functions.														
MODULE - V														
Applications of network and internet security: Cloud computing- Data protection on the cloud, cloud security as a service, Web/Internet security protocols- HTTPS, SSL, SSH, Wireless network security, Mobile device security, Email Security-Pretty good privacy, S/MIME.													8 Hours	
Legal and Ethical issues- Introduction to Cybercrime & computer crime, Intellectual property, Privacy, Ethical issues.														
COURSE OUTCOMES														
Upon completion of this course, the students will be able to:														
CO No.	Course Outcome Description												Bloom's Taxonomy Level	
CO1	Understand the fundamentals of networks security, security architecture, threats and vulnerabilities												CL2	
CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms.												CL3	
CO3	Apply the different cryptographic operations of public key cryptography												CL3	
CO4	Apply the various Authentication schemes to simulate different applications.												CL3	
CO5	Understand various Security practices and System security standards.												CL4	
CO-PO-PSO MAPPING														
CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1	1	1	1				2	1	3	2	2	1
CO2	3	3	3	2	3		1		2	1	2	2	3	1
CO3	3	3	2	2	3				1	1	2	2	3	2
CO4	2	3	3	2	3				2	1	2	3	2	2
CO5	2	3	3	2	2	2			3	1	2	3	3	3
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				
ASSESSMENT STRATEGY														
Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect														



methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)			Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)		Assignment/ Activities (40%)		
I	II			III
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules



- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

TEXT BOOKS:

1. Atul Kahate, Cryptography and Network Security, 4th Edition, 2019
2. William Stallings, Cryptography and Network Security: Principles and Practices, 7th Edition, 2019.
3. Nina Godbole and Sunit Belapure, Cyber Security, 1st Edition, 2019.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://www.geeksforgeeks.org/cryptography-and-network-security-principles>
2. <https://www.codingninjas.com/studio/library/cryptography-and-network-security>



SOFTWARE ARCHITECTURE AND DESIGN PATTERNS
(Effective from the Academic Year 2023 - 2024)
VI SEMESTER

Course Code	21CS654	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Fundamental knowledge of C++ Programming
- Fundamental Knowledge of Object-Oriented Programming Concepts
- Fundamental concepts of Software Engineering

COURSE OBJECTIVES:

- Learn and apply various modeling techniques used for the design of Object-Oriented systems
- Learn various UML diagrams used for the design of Object-Oriented systems
- Identify and apply various design patterns for building the structure of the Object-oriented systems
- Identify and apply various design patterns for specifying the behaviors of the components of an Object-oriented system
- Learn and apply the MVC architecture for building applications

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Class Modeling: Advanced Object and Class Concepts, N-ary Associations, Aggregation, Abstract Classes, Packages.	8 Hours
State Modeling: Events, States, Transitions and Conditions, State Diagram, State Diagram Behaviors, Nested State Diagrams, Nested States, Concurrency	
Interaction Modeling: Use Case Models, Sequence models, Activity Models, Use-Case relationships, Procedural Sequence Model, Special Construct for Activity Models	



MODULE – II				
Analysing a System: Overview of Analysis Phase, Stage-1: Gathering Requirements, Functional Requirement Specification, Defining Conceptual Classes and Relationships, Design and Implementation The Unified Modeling Language: Communication Diagrams, Timing Diagrams, Activity Diagrams, Interaction overview Diagrams, Component Diagrams, Composite Structure Diagrams, Package Diagrams, Object Diagrams, Deployment Diagrams				8 Hours
MODULE - III				
Design Patterns: Design Pattern and its Description, Catalog of Design pattern, organizing the catalog, how design patterns solve design problems, Selecting Design Pattern, Using Design patterns. Structural patterns: Adapter, bridge, composite, decorator, facade, flyweight, proxy.				8 Hours
MODULE - IV				
Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Template Method				8 Hours
MODULE – V				
Interactive systems and the MVC architecture: Introduction, The MVC architectural pattern, analyzing a simple drawing program, designing the system, designing of the subsystems, getting into implementation, implementing undo operation, drawing incomplete items, adding a new feature, pattern-based solutions.				8 Hours
ASSESSMENT STRATEGY				
Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:				
Sl. No.	Assessment Description		Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)		100 %	50
	Continuous Internal Evaluation (CIE)		60 %	30
	Assignments		40 %	20
2	Semester End Examination (SEE)		100 %	50
ASSESSMENT DETAILS				
Continuous Internal Assessment (CIA) (50%)			Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)		Assignment/ Activities (40%)		
I	II		III	
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV
Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped				



to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: *The assignments mentioned above may be provided appropriately to the students belonging to different bands*

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

TEXT BOOKS:

1. Michael R Blaha, James R Rumbaugh, “Object Oriented Modeling and Design with UML”, 2nd Edition, 2005 (Twelfth Impression, 2012)
2. Brahma Dathan, Sarnath Ramnath, “Object Oriented Analysis, Design and Implementation: An Integrated Approach”, Second Edition, Universities Press (India) Private Limited, 2010 (Reprinted 2018)
3. Erich Gamma, Richard Helm, “Design Patterns – Elements of Reusable Object-Oriented Software”, Pearson Education, 2006 (Fifteenth Impression)

REFERENCE BOOKS:

1. Craig Larman, “Applying UML and Patterns – An Introduction to Object Oriented Analysis & Design and the Unified Process”, Second Edition.
Link: <https://personal.utdallas.edu/~chung/SP/applying-uml-and-patterns.pdf>



ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY
(Effective from the Academic Year 2023 - 2024)

VI SEMESTER

Course Code	21ISL66	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	20P	Exam Hours	03

CREDITS – 1

COURSE PREREQUISITES:

- Basic Knowledge of Python programming and mathematics concepts like probability.

Description

1. The programs can be implemented in either JAVA or Python.
2. Data sets can be taken from standard repositories

COURSE OBJECTIVES:

- To Learn basic concepts of Python through illustrative examples and small exercises
- To prepare students to become Familiarity with the Python programming in AI environment.
- To train Students with python programming as to comprehend, analyze, design and create AI platforms and solutions for the real-life problems.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

LIST OF EXPERIMENTS

Sl. No.	Description	CO No.
1	Write a program to implement Tic-Tac-Toe game.	CO1
2	Write a program to implement A* Search Algorithm.	CO1



3	Implement and demonstrate the FIND-S Algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.	CO2
4	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.	CO2
5	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. Built-in Java classes/API can be used to write the program.	CO3
6	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.	CO3
7	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.	CO4
8	Demonstrate the working of SVM classifier for a suitable dataset.	CO4
9	Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.	CO5
10	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.	CO5

COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Implement and demonstrate artificial intelligence algorithms problem-solving skills.	CL3
CO2	Apply FIND-S and Candidate-Elimination for hypothesis generation and refinement using real-world datasets.	CL3
CO3	Demonstrate proficiency in implementing Decision Tree-based ID3 and Artificial Neural Networks using backpropagation for classification tasks.	CL3
CO4	Demonstrate the implementation of Naïve Bayesian Classifier and Support Vector Machine (SVM) to evaluate, and interpret classification models through performance	CL3



The average marks obtained across all the experiments will be the marks obtained for (A).

- A Laboratory Test, similar to the SEE exam is conducted towards the end of the Semester/Course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B)

The Sum of marks obtained across (A) and (B) will be the Final CIA marks.

III. In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by considering the weightages given above, i.e. (A) – 25 Marks (Weekly Assessment), (B) – 15 Marks (Laboratory Examination), (C) – 10 marks (Open Ended Experiments/Mini Projects)

- The respective course instructor will design the assessment criteria for the said assessment components.
- The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.

In all the cases, the assessments will be done based on the criteria designed by the Course Coordinator.

SEE QUESTION PAPER PATTERN:

1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.
2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

REFERENCE WEB LINKS AND VIDEO LECTURES (E – RESOURCES):

1. <https://www.edureka.co/blog/artificial-intelligence-with-python/>
2. <https://www.youtube.com/watch?v=c8W7dRPdIPE>
3. <https://www.youtube.com/watch?v=YcETNp4ea-Y>



CLOUD COMPUTING, SECURITY AND PRIVACY
(Effective from the Academic Year 2023 - 2024)
VII SEMESTER

Course Code	21IS71	CIA Marks	50
Number of Contact Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Contact Hours	40	Exam Hours	03

CREDITS - 3

Prerequisites:

- Fundamental knowledge of databases, Operating Systems and Networking

Course Objectives:

This course will enable students to:

- Discuss the concepts, characteristics, delivery models and benefits of cloud computing.
- Explore the key technical, organisational and compliance challenges of cloud computing.
- Explore the security issues that arise from cloud computing architectures intended for delivering Cloud based enterprise IT services.

Teaching-Learning Strategy:

Following are some sample strategies that can be incorporated for the Course Delivery:

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem-Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction: The Evolution of Cloud Computing; What Is Cloud Computing?: Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model, Cloud Deployment Models, Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise.	8 Hours
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MODULE - II

Infrastructure Security: Infrastructure Security: The Network Level, Infrastructure Security: The Host Level, Infrastructure Security: The Application Level. Data Security and Storage: Aspects of Data Security, Data Security Mitigation, Provider Data	8 Hours
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and Its Security.			
MODULE - III			
Identity and Access Management: Trust Boundaries and IAM, Why IAM?, IAM Challenges, IAM Definitions, IAM Architecture and Practice, Relevant IAM Standards and Protocols for Cloud Services, IAM Standards, Protocols, and Specifications for Consumers, Comparison of Enterprise and Consumer Authentication Standards and Protocols, IAM Practices in the Cloud, Cloud Authorization Management, Cloud Service Provider IAM Practice			8 Hours
MODULE - IV			
Security Management in the Cloud: Introduction, Security Management Standards, Security Management in the Cloud, Availability Management, SaaS Availability Management, PaaS Availability Management, IaaS Availability Management, Access Control, Security Vulnerability, Patch, and Configuration Management.			8 Hours
MODULE - V			
Privacy: What Is Privacy?, What Is the Data Life Cycle?, What Are the Key Privacy Concerns in the Cloud?, Who Is Responsible for Protecting Privacy? Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations. Audit and Compliance: Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Illustrative Control Objectives for Cloud Computing, Incremental CSP-Specific Control Objectives, Additional Key Management Control Objectives, Control Considerations for CSP Users, Regulatory/External Compliance, Other Requirements, Cloud Security Alliance, Auditing the Cloud for Compliance.			8 Hours
LABORATORY COMPONENTS			
Exp. No.	Experiment Description	CO No.	Bloom's Taxonomy Level
1.	Create a simple web application that gets a token from KMS or Keycloak (open source). The token exchange should be enabled by cacerts verification. The token should be valid for a session only and set expiration timer. Validate by trying to access the application. Cloud Security Feature: Web application security on Cloud using Tokens and Oauth Expected Outcome: When session closed or token expired, user should get invalid token or permissions error.	CO2	CL3
2.	Develop a small Java client server application that sends messages and receives acknowledgement. Encrypt the message using AECS or equivalent mechanism. Decrypt at the	CO2	CL3



	server and provide appropriate response. Validate by sending non-encrypted messages. Cloud Security Feature: Secure messaging over Cloud Expected Outcome: Only encrypted messages should be processed.		
3.	Create a public cloud account (AWS/Azure/GCP) with free trial credit. Create IAM roles; define policies for admin, developers, customer and maintainer. Create users for each role and validate if users access are within defined limits. (Optional: Write a Java program to access AWS service) Cloud Security Feature: Authentication and Authorization Expected Outcome: Only admin should have complete access. Other users should have limited accesses.	CO3	CL3
4.	On the VPC and VM created in experiment #2, deploy a “Hello World” Java web application. Control the application by creating a load balancer and API gateway or service registry. Define rules to limit access to few users. Validate the rules are working, by trying to access the webpage. Cloud Security Feature: Cloud application access Expected Outcome: Application should be working for only users with access. Others should get access denied.	CO3	CL3
5.	Create a VPC, create a small VM, provision disk storage, and store a file in the storage. Define VPC rules, security groups for VM, access controls for storage. Validate the defined security controls by creating different users. Cloud Security Feature: Cloud infrastructure access control Expected Outcome: Only admin and users with particular access should be able to connect to the VM, get file on disk. Other users should be denied.	CO4	CL3

COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Outline the concept of cloud computing and discuss the types of services offered through cloud computing.	CL2
CO2	Describe the IT infrastructure security capabilities offered by the cloud services. Also identify the current state of data security and the data storage in the cloud.	CL3
CO3	Explain the identity and access management (IAM) practice and make use of capabilities for Authentication, authorization, and auditing of users who access cloud services.	CL3
CO4	Identify the security management frameworks and the standards that are relevant for the Cloud.	CL3



CO5	Outline the privacy aspects to consider within the context of cloud computing and illustrate the importance of audit and compliance functions within the cloud.													CL2	
CO-PO-PSO MAPPING															
CO No.	Programme Outcomes (PO)													Program me Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	3	3	2	2								2	2	2	
CO2	3	3	2	2	3							2	3	3	
CO3	3	3	3	2	3						2	2	3	2	
CO4	3	3	3	2	3						2	2	3	3	
CO5	3	3	3	2							2	2	3	3	
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)					
ASSESSMENT STRATEGY															
Assessment will be both CIA and SEE. Student's learning will be assessed using Direct and Indirect methods.															
Sl.	Assessment Description					Weightage (%)					Max. Marks				
1	Continuous Internal Assessment					100 %					50				
	Continuous Internal Evaluation					60 %					30				
	Assignments					40 %					20				
2	Semester End Examination					100 %					50				
ASSESSMENT DETAILS															
Continuous Internal Assessment (CIA) (50%)										Semester End Exam (SEE) (50%)					
Continuous Internal Evaluation (CIE) (60%)					Assignment/ Activities (40%)										
I	II	III													
Syllabus Coverage					Syllabus Coverage					Syllabus Coverage					
40%	30%		30%			100%					100%				
M I						M I					M I				
M II						M II					M II				
	M III					M III					M III				
	M IV		M IV			M IV					M IV				
			M V			M V					M V				
Note:															
- Assessment will be both CIA and SEE. - The practical sessions of the IPCC shall be for CIE only. - The Theory component of the IPCC shall be for both CIA and SEE respectively. - The questions from the practical sessions shall be included in Theory SEE.															



Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

SEE Question Paper Pattern:

- The question paper will have **TEN** full questions from **FIVE** Modules.
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer **FIVE** full questions, selecting one full question from each module.

Text Books:

1. Tim Mather, Subra Kumaraswamy, Shahed Latif: "Cloud Security and Privacy, An Enterprise Perspective on Risks and Compliance", Oreilly Media, 2009.
2. Vic (J.R.) Winkler: "Securing the Cloud, Cloud Computer Security Techniques and Tactics", Syngress, 2011

Reference Web Links And Video Lectures (E-Resources):

1. <https://www.digimat.in/nptel/courses/video/106105167/L01.html>
2. <https://www.youtube.com/watch?v=44IBhZwa4ZM>
3. <https://www.digimat.in/nptel/courses/video/106104182/L01.html>



SOFTWARE TESTING
(Effective from the Academic Year 2023 - 2024)
VII SEMESTER

Course Code	21IS72	CIA Marks	40
Number of Contact Hours/Week (L: T: P: S)	3:0:0	SEE Marks	60
Total Hours of Pedagogy	40	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Software engineering and C language

Course Objectives:

This course will enable students to:

- Differentiate the various testing techniques
- Analyze the problem and derive suitable test cases.
- Apply suitable technique for designing of flow graph
- Learn about automation testing and when to automate the application

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

BASICS OF SOFTWARE TESTING: Basic definitions, Software Quality , Requirements, Behavior and Correctness, Correctness versus Reliability, Testing and Debugging, Test cases, Insights from a Venn diagram, Identifying test cases, Test-generation Strategies, Test Metrics, Error and fault taxonomies , Levels of testing, Testing and Verification, Static Testing.

PROBLEM STATEMENTS: Generalized pseudocode, the triangle problem, the NextDate function, the commission problem, the SATM (Simple Automatic Teller Machine) problem,

8 Hours



the currency converter, Saturn windshield wiper		
MODULE - II		
FUNCTIONAL TESTING: Boundary value analysis, Robustness testing, Worst-case testing, Robust Worst testing for triangle problem, NextDate problem and commission problem, Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations, Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations. FAULT BASED TESTING: Overview, Assumptions in fault based testing, Mutation analysis, Fault-based adequacy criteria, Variations on mutation analysis.		8 Hours
MODULE - III		
STRUCTURAL TESTING: Overview, Statement testing, Programme testing, Condition testing , Path testing: DD paths, Test coverage metrics, Basis path testing, guidelines and observations, Data –Flow testing: Definition-Use testing, Slice-based testing, Guidelines and observations. TEST EXECUTION: Overview of test execution, from test case specification to test cases, Scaffolding, Generic versus specific scaffolding, Test oracles, Self-checks as oracles, Capture and replay.		8 Hours
MODULE - IV		
AUTOMATION TESTING : From Manual to Automation testing: First attempt record and playback, Getting the most out of test automation, Difference between Manual and automated test ,Exploratory testing. Variety of tools: Classification of tools ,IDEs and Programming language,(unit) testing frameworks,BDD-style Frameworks,SUT interaction technologies.		8 Hours
MODULE - V		
Introduction to Web drivers: First Steps, What is WebDriver? How WebDriver works? The history of Selenium, The tools you need to get started. Locating elements on a page: Locating one or more elements based on ID, class, or name, Fine-grained targeting using complex CSS selectors, Making pages amenable to element locating.		8 Hours
COURSE OUTCOMES		
Upon completion of this course, the students will be able to:		
CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Understand the concepts of testing and apply to derive different test cases	CL2
CO2	Analyze and compare the different testing techniques	CL2
CO3	Apply the appropriate testing techniques in classifying the problem	CL3
CO4	Analyze the different approach in software test automation problems and solutions.	CL3



CO5	Evaluate the techniques and skills on how to use modern software testing tools to support software testing projects.	CL5
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CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2			2							3	2	3
CO2	3	2			2							3	2	3
CO3	3	2			2							3	2	3
CO4	3	2			2							3	2	3
CO5	3	2			2							3	2	3
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05



2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

TEXT BOOKS:

1. Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2008. (Listed topics only from Chapters 1, 2, 5, 6, 7, 9, 10, 12, 13)
2. Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2009. (Listed topics only from Chapters 3, 4, 16, 17, 20,21, 22,24)
3. Aditya P Mathur: Foundations of Software Testing, Pearson Education, 2008.(Listed topics only from Section 1.2 , 1.3, 1.4 ,1.5, 1.8,1.12,6. 2.1,6. 2.4)
4. Complete guide to test automation ,Techniques, Practices, and Patterns for Building and Maintaining Effective Software Projects Arnon Axelrod,2018.
5. Selenium Web driver from foundations to framework , Yujun Liang and Alex Collins,2016

REFERENCE BOOKS:

1. Software testing Principles and Practices – Gopalaswamy Ramesh, Srinivasan Desikan, 2 nd Edition, Pearson, 2007.
2. Software Testing – Ron Patton, 2nd edition, Pearson Education, 2004.
3. The Craft of Software Testing – Brian Marrick, Pearson Education, 1995.
4. Anirban Basu, Software Quality Assurance, Testing and Metrics, PHI, 2015.
5. Naresh Chauhan, Software Testing, Oxford University press.



ROBOTIC PROCESS AUTOMATION
(Effective from the Academic Year 2023 - 2024)
VII SEMESTER

Course Code	21CS731	CIA Marks	50
Number of Contact Hours/Week (L: T:P:S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40 L + 20 S	Exam Hours	03

CREDITS – 3

Prerequisites:

- Fundamental knowledge of any programming language

Course Objectives:

This course will enable students to:

- To understand basic concepts of RPA.
- To Describe RPA, where it can be applied and how its implemented
- To Describe the different types of variables, Control Flow and data manipulation techniques
- To Understand Image, Text and Data Tables Automation
- To Describe various types of Exceptions and strategies to handle

Teaching - Learning Strategy:

These are some sample strategies, which course faculty members can incorporate in the Teaching Learning Process:

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses

COURSE CONTENTS

MODULE - 1

Module Contents	Lecture Hours
RPA Foundations: What is RPA – Flavors of RPA- History of RPA- The Benefits of RPA- The downsides of RPA- RPA Compared to BPO, BPM and BPA – Consumer Willingness for Automation- The	8 Hours



Workforce of the Future- RPA Skills-On-Premise Vs. the Cloud- Web Technology- Programming Languages and Low Code- OCR-Databases-APIs- AI-Cognitive Automation- Agile, Scrum, Kanban and Waterfall, DevOps- Flowcharts.		
MODULE - 2		
RPA Platforms: Components of RPA- RPA Platforms-About Ui Path- About UiPath - The future of automation - Record and Play - Downloading and installing UiPath Studio -Learning Ui Path Studio- - Task recorder - Step-by step examples using the recorder.		8 Hours
MODULE - 3		
Sequence, Flowchart, and Control Flow: Sequencing the workflow Activities-Control flow, various types of loops, and decision-making Step-by-step example using Sequence and Flowchart-Step-by-step example using Sequence and Control Flow-Data Manipulation-Variables and Scope Collections-Arguments – Purpose and use-Data table usage with examples Clipboard Management-File operation with step-by-step example-CSV/Excel to data table and vice versa (with a step-by-step example).		8 Hours
MODULE - 4		
Taking Control of the Controls: Finding and attaching windows- Finding the control- Techniques for waiting for a control- Act on controls – mouse and keyboard activities- Working with Ui Explorer- Handling events- Revisit recorder- Screen Scraping- When to use OCR- Types of OCR available- How to use OCR- Avoiding typical failure points.		8 Hours
MODULE - 5		
Exception Handling, Debugging, and Logging- Exception handling- Common exceptions and ways to handle them- Logging and taking screenshots Debugging techniques- Collecting crash dumps- Error reporting- Future of RPA.		8 Hours
COURSE OUTCOMES		
Upon completion of this course, the students will be able to:		
CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Discuss various Components of Robotic Process Automation and understand the management of process, memory and storage. Also discuss various types of RPA tools, operations on processes and the communication pattern between two processes.	CL2



CO2	Explain the concept of Activities involved in project Automation and discuss various Advanced concepts of RPA	CL2
CO3	Describe the various RPA packages, its characteristics and its applications in process Automation	CL2
CO4	Discuss the role of process automation in building interactive user interface and handling various file types	CL2
CO5	Explain the various phases of E-mail automation technique and use various tools for debugging and Exception Handling.	CL2

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Program me Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3											2	
CO2	3	3											2	
CO3	3	2	2										2	
CO4	3	2	2										2	
CO5	3	2	2										2	
3: Substantial (High)				2: Moderate (Medium)					1: Poor (Low)					

CO - Assessment Mapping:

Course Outcomes	Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)
	Continuous Internal Evaluation (CIE) (60%)			Assignme nt/Activit ies (40%)	
	I	II	III		
	Syllabus Coverage				
	40%	30%	30%	100%	
CO1	MI			MI	MI
CO2	MII	MII		MII	MII
CO3		MIII		MIII	MIII
CO4			MIV	MIV	MIV
CO4			MV	MV	MV

**Assessment Strategy:**

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments*	40 %	20
2	Semester End Examination (SEE)	100 %	50

Assignment Types:

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	5
2	Quiz	25 %	5
3	Field Visits/Survey/Case Studies	50 %	10
4	Model / Prototype Development	100 %	20
5	Project Based Learning		
6	Seminar/Presentation	25 %	5
7	Peer - to -Peer Learning	25 %	5

SEE Question Paper Pattern:

- The question paper will have **TEN** full questions.
- Each full question consisting of 20 marks.
- There will be 2 full questions from all the FIVE modules.
- Each full question will have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Tom Taulli, The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems, 2020, ISBN-13 (electronic): 978-1-4842-5729-6, Publisher: A press.
2. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: Packt Publishing Release Date: March 2018 ISBN: 9781788470940.
3. Frank Casale, Rebecca Dilla, Iieidi Jaynes, Lauren Livingston, "Introduction to Robotic Process Automation: a Primer", Institute of Robotic Process Automation.
4. Richard Murdoch, I{obotic Process Automation: Guide to Building Software robots, Automate Repetitive Tasks & Become An RPA Consultant.
5. Srikanth Merianda, Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation.

Reference Web Links and Video Lectures (e - Resources):

1. <https://www.uipath.com/>
2. <https://www.uipath.com/rpa/robotic-process-automation>



DATA VISUALIZATION USING PYTHON
(Effective from the Academic Year 2023 - 2024)
VII SEMESTER

Course Code	21IS732	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Fundamental knowledge of Mathematics, Data Structures.

COURSE OBJECTIVES:

- To understand the essential acquisition techniques
- To analyze and visualize data
- To gain hands-on experience of using software tools for data analytics

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

The Importance of Data Visualization and Data Exploration Introduction: Data Visualization, Importance of Data Visualization, Data Wrangling, Tools and Libraries for Visualization

Overview of Statistics: Measures of Central Tendency, Measures of Dispersion, Correlation, Types of Data, Summary Statistics

Numpy: Numpy Operations - Indexing, Slicing, Splitting, Iterating, Filtering, Sorting, Combining, and Reshaping

Pandas: Advantages of pandas over numpy, Disadvantages of pandas, Pandas operation - Indexing, Slicing, Iterating, Filtering, Sorting and Reshaping using Pandas

8 Hours

MODULE - II

Plots Comparison Plots: Line Chart, Bar Chart and Radar Chart; Relation Plots: Scatter Plot, Bubble Plot, Correlogram and Heatmap; Composition Plots: Pie Chart, Stacked Bar Chart, Stacked Area Chart, Venn Diagram; Distribution Plots: Histogram, Density Plot, Box Plot, Violin Plot; Geo Plots: Dot Map, Choropleth Map, Connection Map; What Makes a Good Visualization? A Deep Dive into Matplotlib: Introduction, Overview of Plots in Matplotlib, Pyplot Basics: Creating Figures, Closing Figures, Format Strings, Plotting, Plotting Using pandas DataFrames, Displaying Figures, Saving Figures; Basic Text and Legend Functions: Labels, Titles, Text, Annotations, Legends; Basic Plots: Bar Chart, Pie Chart, Stacked Bar Chart, Stacked Area Chart, Histogram, Box Plot, Scatter Plot, Bubble Plot; Layouts: Subplots, Tight Layout, Radar Charts, GridSpec; Images: Basic Image Operations, Writing Mathematical Expressions		8 Hours
MODULE - III		
Simplifying Visualizations using Seaborn Introduction, Advantages of Seaborn Controlling Figure Aesthetics: Seaborn Figure Styles, Removing Axes Spines, Contexts; Color Palettes: Categorical Color Palettes, Sequential Color Palettes, Diverging Color Palettes; Interesting Plots in Seaborn: Bar Plots, Kernel 10 JBoS 31.05.2021 EC 2.2.1., Dated: 29.06.2021 Density Estimation, Plotting Bivariate Distributions, Visualizing Pairwise Relationships, Violin Plots;		8 Hours
MODULE - IV		
Plotting Geospatial Data Introduction, Geoplotlib, The Design Principles of Geoplotlib, Geospatial Visualizations, Tile Providers, Custom Layers, Introduction to Folium Visualizing Data: Building a Google map from geocoded data, Visualizing networks and interconnection and Visualizing mail data		8 Hours
MODULE - V		
Making Things Interactive with Bokeh Introduction, Bokeh, Concepts of Bokeh, Interfaces in Bokeh, Output, Bokeh Server, Presentation, Integrating, Adding Widgets Networked Programs HyperText Transfer Protocol – HTTP, The World's Simplest Web Browser, Retrieving an image over HTTP, Retrieving web pages with urllib, Parsing HTML and scraping the web, Parsing HTML using regular expressions, Parsing HTML using BeautifulSoup, Reading binary files using urllib		8 Hours
COURSE OUTCOMES		
Upon completion of this course, the students will be able to:		
CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Understand and use various plot types with Python	CL3
CO2	Explore and work with different plotting libraries	CL3
CO3	Create effective visualizations	CL3
CO4	Implement exemplary applications related to Network Programming and Web	CL3



	Service	
CO5	Exhibit the awareness of the importance and limitation of the exploratory data analysis paradigm	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1														
CO2														
CO3														
CO4														
CO5														
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)	
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)		
I	II	III			
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage	
40%	30%	30%	100%	100%	
MI			MI	MI	
MII	MII		MII	MII	
	MIII		MIII	MIII	
		MIV	MIV	MIV	
		MV	MV	MV	

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl.	Assignment Description	Max. Weightage	Max.
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No.		(%)	Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer **FIVE** full questions, selecting one full question from each module.

TEXT BOOKS:

1. Data Visualization workshop, Tim Grobmann and Mario Dobler, Packt Publishing
2. Python for Everybody: Exploring Data Using Python 3, Charles R. Severance, Create Space Independent Publishing Platform, 1st Edition

REFERENCE BOOKS:

1. “Data Visualization”: A Successful Design Process, Kirk, Andy, Packt Publishing Ltd, 2012
2. Think Python: How to Think Like a Computer Scientist, Allen B. Downey, Green Tea Press, 2nd Edition, 2015
3. Interactive Data visualization for the Web, Murray, Scott, O’Reilly Media, Inc., 2013
4. Visualizing Data: Exploring and Explaining Data with The Processing Environment, Fry, Ben, O’Reilly Media, Inc., 2007



NATURAL LANGUAGE PROCESSING
(Effective from the Academic Year 2023 - 2024)
VII SEMESTER

Course Code	21IS733	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

Course Prerequisites:

Fundamentals of Automata Theory and Basic knowledge of English Grammar.

Course Objectives:

- Define the natural language and analyze the importance of natural language.
- Analyze spelling error detection and correction methods and parsing techniques in NLP.
- Understand the Applications of natural language processing.
- Illustrate the information retrieval models in natural language processing.

Teaching - Learning Strategy:

Following are some sample strategies that can be incorporated for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Overview and language modeling: Overview: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages- NLP Applications,
Language Modeling: Statistical Language Model- N-gram model- (**unigram, bigram**), Paninon Framework, Karaka theory.

8 Hours

MODULE - II

Word Level Analysis: Regular Expressions, Finite State Automata, Morphological Parsing, Spelling Error Detection and Correction, Words and Word Classes-Part-of Speech Tagging.

8 Hours



Syntactic Analysis: Context-free Grammar, Constituency, top-down and bottom-up Parsing, CYK parsing.		
MODULE - III		
Naive Bayes and Sentiment Classification: Naive Bayes Classifiers, Training the Naive Bayes Classifier, Worked example, Optimizing for Sentiment Analysis, Naive Bayes for other text classification tasks, Naive Bayes as a Language Model		8 Hours
MODULE - IV		
Information Retrieval and Lexical Resources: Information Retrieval: Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval- Custer model, Fuzzy model, LSTM model, Major Issues in Information Retrieval. Lexical Resources: Word Net, Frame Net, Stemmers, POS Tagger- Research Corpora.		8 Hours
MODULE - V		
Machine Translation: Language Divergences and Typology, Machine Translation using Encoder-Decoder, Details of the Encoder-Decoder Model, Translating in low-resource situations, MT Evaluation, Bias and Ethical Issues.		8 Hours
COURSE OUTCOMES		
Upon completion of this course, the students will be able to:		
CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Understand the fundamental concept of NLP; define grammar-based language model and statistical-based language model.	CL2
CO2	Demonstrate the use of morphological analysis and parsing using Finite State Transducers, spelling error detection and correction, parts of speech tagging, context-free grammar, and different parsing approaches.	CL3
CO3	Apply the Naïve Bayes classifier and sentiment analysis for Natural language problems and text classifications.	CL3
CO4	Illustrate the use of Information Retrieval in the context of NLP and understand the concept of lexical semantics, lexical dictionaries such as WordNet, lexical computational semantics, and distributional word similarity.	CL3
CO5	Discuss the Machine Translation applications of NLP using Encode and Decoder. Understand the MT evaluation, translating in low resource situations, bias and ethical issues.	CL2
CO-PO-PSO MAPPING		
CO No.	Programme Outcomes (PO)	Programme Specific Outcome



													(PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1		2			2	1		2	2	1	1
CO2	3	2	2		2			2	1		2	2	2	2
CO3	3	2	2		2			2	1		2	2	2	2
CO4	3	2	2		2			2	1		2	2	2	2
CO5	3	2	1		2			2	1		2	2	1	1
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

Assignment Types With Weightages

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10



8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE Question Paper Pattern:

- The question paper will have TEN full questions from FIVE Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

Reference Books:

3. Tanveer Siddiqui, U.S. Tiwary, “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008.
4. D. Jurafsky, J. H. Martin, “Speech and Language Processing, An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition (3e)”, Pearson Education, 2023.
5. Akshay Kulkarni, Adarsha Shivananda, “Natural Language Processing Recipes - Unlocking Text Data with Machine Learning and Deep Learning using Python”, Apress, 2019
6. James Allen, “Natural Language Understanding”, 2nd edition, Benjamin/Cummings publishing company, 1995.
7. Gerald J. Kowalski and Mark.T. Maybury, “Information Storage and Retrieval systems”, Kluwer Academic Publishers, 2000

Reference Web Links And Video Lectures (E-Resources):

1. <https://www.youtube.com/watch?v=M7SWr5xObkA>
2. <https://youtu.be/02QWRAhGc7g>
3. <https://www.youtube.com/watch?v=CMrHM8a3hqw>



HIGH PERFORMANCE COMPUTING
(Effective from the Academic Year 2023 - 2024)
VII SEMESTER

Course Code	21IS734	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Fundamental knowledge of computer organization and architecture.

COURSE OBJECTIVES:

- Introduce the design, analysis, and implementation, of high-performance computational science and engineering applications.
- Illustrate on advanced computer architectures, parallel algorithms, parallel languages, and performance-oriented computing.

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Introduction to Parallel Computing: Motivating Parallelism, Scope of Parallel Computing.
Parallel Programming Platforms: Implicit Parallelism: Trends in Microprocessor Architectures, Limitations of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Routing Mechanisms for Interconnection Networks, Impact of Process-Processor Mapping and Mapping Techniques.

8 Hours

MODULE - II

Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques,

8 Hours



Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models. Basic Communication Operations: One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Scatter and Gather, All-to-All Personalized Communication, Circular Shift, Improving the Speed of Some Communication Operations		
MODULE - III		
Analytical Modeling of Parallel Programs: Sources of Overhead in Parallel Programs, Performance Metrics for Parallel Systems, The Effect of Granularity on Performance, Scalability of Parallel Systems. Minimum Execution Time and Minimum Cost-Optimal Execution Time, Asymptotic Analysis of Parallel Programs Section 5.7. Other Scalability Metrics, Programming Using the Message-Passing Paradigm: Principles of Message-Passing Programming, The Building Blocks: Send and Receive Operations, MPI: The Message Passing Interface, Topologies and Embedding, Overlapping Communication with Computation, Collective Communication and Computation Operations, Groups and Communicators		8 Hours
MODULE - IV		
Programming Shared Address Space Platforms: Thread Basics, Why Threads? The POSIX Thread API, Thread Basics: Creation and Termination, Synchronization Primitives in Pthreads, Controlling Thread and Synchronization Attributes, Thread Cancellation, 08 Composite Synchronization Constructs, Tips for Designing Asynchronous Programs, OpenMP: A Standard for Directive Based Parallel Programming Dense Matrix Algorithms: Matrix-Vector Multiplication, Matrix-Matrix Multiplication, Solving a System of Linear Equations Sorting: Issues in Sorting on Parallel Computers, Sorting Networks, Bubble Sort and its Variants, Quicksort, Bucket and Sample Sort.		8 Hours
MODULE - V		
Graph Algorithms: Definitions and Representation, Minimum Spanning Tree: Prim's Algorithm, Single-Source Shortest Paths: Dijkstra's Algorithm, All-Pairs Shortest Paths, Transitive Closure, Connected Components, Algorithms for Sparse Graphs, Search Algorithms for Discrete Optimization Problems: Definitions and Examples, Sequential Search Algorithms, Search Overhead Factor, Parallel Depth-First Search, Parallel Best-First Search, Speedup, Anomalies in Parallel Search Algorithms		8 Hours
COURSE OUTCOMES		
Upon completion of this course, the students will be able to:		
CO No.	Course Outcome Description	Bloom's Taxonomy Level



CO1	Apply the concepts of parallel computing to address and resolve computational problems that require parallelism.	CL3
CO2	Use decomposition techniques and basic communication operations to develop efficient parallel algorithms.	CL3
CO3	Illustrate the performance metrics and scalability factors to optimize the execution of parallel programs.	CL3
CO4	Apply parallel programs using threading and synchronization constructs, including POSIX Threads and OpenMP.	CL3
CO5	Execute parallel algorithms to solve graph-related problems and assess their performance in terms of efficiency and scalability.	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	1				2				2	1	
CO2	3	3	2					2				2	1	
CO3	3	3	3					2				2	1	
CO4	3	3	3					2				2	1	
CO5	3	3	3					2				2	1	
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV



Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

REFERENCE BOOKS:

1. Introduction to Parallel Computing, AnanthGrama, Anshul Gupta, George Karypis, and Vipin Kumar, 2nd edition, Addison-Welsey, 2003.
2. Grama, A. Gupta, G. Karypis, V. Kumar, An Introduction to Parallel Computing, Design and Analysis of Algorithms: 2/e, Addison-Wesley, 2003.
3. G.E. Karniadakis, R.M. Kirby II, Parallel Scientific Computing in C++ and MPI: A Seamless Approach to Parallel Algorithms and their Implementation, Cambridge University Press, 2003.
4. Wilkinson and M. Allen, Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers, 2/E, Prentice Hall, 2005.
5. M.J. Quinn, Parallel Programming in C with MPI and OpenMP, McGraw-Hill, 2004.



6. G.S. Almasi and A. Gottlieb, Highly Parallel Computing, 2/E, Addison-Wesley, 1994.
7. David Culler Jaswinder Pal Singh, "Parallel Computer Architecture: A hardware/Software Approach", Morgan Kaufmann, 1999.
8. Kai Hwang, "Scalable Parallel Computing", McGraw Hill 1998.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://www.youtube.com/watch?v=GoXwIVyNvX0>
2. <https://www.youtube.com/watch?v=mG4NLNZ37y4>



INFORMATION MANAGEMENT SYSTEM
(Effective from the Academic Year 2023 - 2024)
VII - SEMESTER

Course Code: OEC	21IS741	CIA Marks	50
Number of Contact Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40 L	Exam Hours	03

CREDITS – 3

Prerequisites:

- Fundamental knowledges of software engineering and project management

Course Objectives:

This course will enable students to:

- To Understand the Role of information management system in business and decision-making process.
- Evaluate the role of the major types of information systems in a business environment and their relationship to each other.

Teaching - Learning Strategy:

These are some sample strategies, which course faculty members can incorporate in the Teaching Learning Process:

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies

COURSE CONTENTS

MODULE - 1

Module Contents	Lecture Hours
Information Systems in Business: Introduction, The real world of Information Systems, Networks, What you need to know, The fundamental role of IS in business, Trends in IS, Managerial challenges of IT. System Concepts: A foundation, Components of an Information System, Information System Resources, Information System activities, Recognizing Information Systems. Fundamentals of strategic advantages: Strategic IT, Competitive strategy concepts, The competitive advantage of IT, Strategic uses of IT, Building a customer-focused business, The value chain and strategic IS, Reengineering business processes, Becoming an agile company Creating a virtual company, Building a knowledge creating company.	8 Hours



MODULE - 2

Enterprise Business Systems: Introduction, Cross-functional enterprise applications, Enterprise application integration, Transaction processing systems, Enterprise collaboration systems. Functional Business Systems: Introduction, Marketing systems, Manufacturing systems, Human resource systems, Accounting systems, Financial management systems.

8 Hours

MODULE - 3

Customer relationship management: Introduction, what is CRM? The three phases of CRM, Benefits and challenges of CRM, Trends in CRM Enterprise resource planning: Introduction, What is ERP? Benefits and challenges of ERP, Trends in ERP. Supply chain Management: Introduction, What is SCM? The role of SCM, Benefits and challenges of SCM, Trends in SCM.

8 Hours

MODULE - 4

Electronic commerce fundamentals: Introduction, The scope of ecommerce, Essential ecommerce, processes, Electronic payment processes. e-Commerce applications and issues: Ecommerce application trends, Business-to- Consumer e-commerce, Web store requirements, Business-to- Business e-commerce, e-commerce marketplaces, Clicks and bricks in ecommerce

8 Hours

MODULE - 5

Decision support in business: Introduction, Decision support trends, Decision support systems (DSS), Management Information Systems, Online analytical processing, Using DSS, Executive information systems, Enterprise portals and decision support, Knowledge management systems, Business and Artificial Intelligence (AI), An overview of AI, Expert systems.

8 Hours

COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Discuss the importance and the roles of Information Systems in the business processes and also understand the basic competitive strategies.	CL2
CO2	Determine various cross functional enterprise systems and how they can provide significant business value to a company.	CL3
CO3	Summarizing the benefits and challenges of CRM, ERP and SCM.	CL2
CO4	Examine the needs of essential processes, categories and business values of e-commerce applications	CL3
CO5	Explain the business process evolutions and the use of decision support systems to tackle the changes.	CL2

CO-PO-PSO MAPPING



CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1			2	1				2	1	3	2	2
CO2	3	1			2	1				2	1	3	2	2
CO3	3	1			2	1				2	1	3	2	2
CO4	3	1			2	1				2	1	3	2	2
CO5	3	1			2	1				2	1	3	2	2

3: Substantial (High)

2: Moderate (Medium)

1: Poor (Low)

CO - Assessment Mapping:

Course Outcomes	Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)
	Continuous Internal Evaluation (CIE) (60%)			Assignm ent/Acti vities (40%)	
	I	II	III		
	Syllabus Coverage				
	40%	30%	30%	100%	100%
CO1	MI			MI	MI
CO2	MII	MII		MII	MII
CO3		MIII		MIII	MIII
CO4			MIV	MIV	MIV
CO4			MV	MV	MV

Assessment Strategy:

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CI)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments*	40 %	20
2	Semester End Examination (SEE)	100 %	50

Assignment Types:

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	5
2	Quiz	25 %	5
3	Field Visits/Survey/Case Studies	50 %	10
4	Model / Prototype Development	100 %	20



5	Project Based Learning		
6	Seminar/Presentation	25 %	5
7	Peer - to -Peer Learning	25 %	5

SEE Question Paper Pattern:

- The question paper will have **TEN** full questions.
- Each full question consisting of 20 marks.
- There will be 2 full questions from all the FIVE modules.
- Each full question will have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. James A.O'Brien, George M Marakas, Management Information Systems, 7th Edition, Tata McGrawHill.
2. Kenneth C. Laudon and Jane P.Laudon, Management Information System, Managing the Digital Firm, 9th Edition, Pearson Education.
3. Steven Alter, Information Systems the Foundation of E-Business, 4th Edition, Pearson Education.
4. W.S.Jawadekar, Management Information System, Tata McGraw Hill.



INTRODUCTION TO CLOUD COMPUTING
(Effective from the Academic Year 2023 - 2024)
VII SEMESTER

Course Code	21IS742	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

Prerequisites:

- Fundamental knowledge of databases, Operating Systems and Networking

Course Objectives:

This course will enable students to:

- Discuss the concepts, characteristics, delivery models and benefits of cloud computing.
- Explore the key technical, organizational and compliance challenges of cloud computing.
- Grasp the concepts of virtualization efficiently.
- Explore the security issues that arise from cloud computing architectures intended for delivering Cloud based enterprise IT services.

Teaching - Learning Strategy:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I



Introduction, Cloud Infrastructure: Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Energy use and ecological impact, Service level agreements, User experience and software licensing. Exercises and problems	8 Hours
MODULE - II	
Cloud Computing: Application Paradigms.: Challenges of cloud computing, Architectural styles of cloud computing, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper, The Map Reduce programming model, A case study: The Grep The Web application, Cloud for science and engineering, High performance computing on a cloud, Cloud computing for Biology research, Social computing, digital content and cloud computing.	8 Hours
MODULE - III	
Cloud Resource Virtualization: Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and paravirtualization, Hardware support for virtualization, Case Study: Xen a VMM based paravirtualization, Optimization of network virtualization.	8 Hours
MODULE - IV	
Cloud Resource Management and Scheduling: Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based Web services, Resourcing bundling: Combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Exercises and problems.	8 Hours
MODULE - V	
Cloud Security, Cloud Application Development: Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor, Amazon web services: EC2 instances, Connecting clients to cloud instances through	8 Hours



firewalls, Security rules for application and transport layer protocols in EC2, How to launch an EC2 Linux instance and connect to it, How to use S3 in java.	
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COURSE OUTCOMES

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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Understand the evolution, principles, and benefits of Cloud Computing in order to assess existing cloud infrastructures to choose an appropriate architecture that meets business needs.	CL2
CO2	Summarize the conceptualization of cloud architecture styles and workflows to coordinate multiple activities.	CL2
CO3	Demonstrate the working of VM and VMM on any cloud platforms (public/private), and run a software service on that.	CL3
CO4	Discuss the different cloud resource management and scheduling strategies.	CL2
CO5	Identify the known threats, risks, vulnerabilities and privacy issues associated with Cloud based IT services.	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3		3			2	2			3	3	3
CO2	3	3	3		3			2	2			3	3	3
CO3	3	3	3		3			2	2			3	3	3
CO4	3	3	3		3			2	2			3	3	3
CO5	3	3	3		3			2	2			3	3	3
3: Substantial (High)				2: Moderate (Medium)						1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:



Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment (CIA)	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10



10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

TEXT BOOKS:

1. Cloud Computing: Theory and Practice, Dan C Marinescu Elsevier (MK), 2013.
2. Computing Principles and Paradigms, RajkumarBuyya , James Broberg, Andrzej Goscinski, Wiley, 2014.
3. Cloud Computing Implementation, Management and Security John W Rittinghouse, James F Ransome, CRC Press, 2013.
4. Vic (J.R.) Winkler: "Securing the Cloud, Cloud Computer Security Techniques and Tactics", Syngress, 2011

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://www.javatpoint.com/cloud-computing-tutorial>
2. https://www.tutorialspoint.com/cloud_computing/index.htm
3. <https://www.digimat.in/nptel/courses/video/106105167/L01.html>
4. https://onlinecourses.nptel.ac.in/noc21_cs14/preview



DATA WAREHOUSING and DATA MINING
(Effective from the Academic Year 2023 - 2024)
VII SEMESTER

Course Code	21IS743	CIA Marks	50
Number of Contact Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Contact Hours	40	Exam Hours	03

CREDITS - 3

Prerequisites:

- Knowledge of Database Management System

Course Objectives:

This course will enable students to:

- Describe the multi-dimensional data models and OLAP.
- Discuss the importance of data in the knowledge discovery process.
- Explain the process of frequent itemset generation and association rule mining.
- Discuss the concepts of classification and illustrate different classification algorithms.
- Understand the concepts of clustering and apply various clustering methods to cluster the given data.

Teaching-Learning Strategy:

Following are some sample strategies that can be incorporated for the Course Delivery:

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem-Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Data Warehousing & Modeling: Data Warehouse: Basic Concepts – What is a Data Warehouse?; Differences between Operational Database Systems and Data Warehouses; But, Why Have a Separate Data Warehouse?; Data Warehousing: A multitiered Architecture; Data	8 Hours
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Warehouse Models: Enterprise Warehouse, Data Mart and Virtual Warehouse; Extraction, Transformation, and Loading; Metadata Repository; Data Warehouse Modeling: Data Cube and OLAP – Data Cube: A Multidimensional Data Model; Stars, Snowflakes and Fact Constellations: Schemas for Multidimensional Data Models; Dimensions: The Role of Concept Hierarchies; Measures: Their Categorization and Computation; Typical OLAP Operations.	
MODULE - II	
Data Warehouse Implementation: Efficient Data Cube Computation: An Overview; Indexing OLAP Data: Bitmap Index and Join Index; Efficient Processing of OLAP Queries; OLAP Server Architectures: ROLAP versus MOLAP versus HOLAP. Data Mining: Introduction - What is Data Mining?; Motivating Challenges; The Origins of Data Mining; Data Mining Tasks; Data - Types of Data, Data Quality, Data Preprocessing, Measures of Similarity and Dissimilarity – Basics, Similarity, and Dissimilarity between Simple Attributes, Dissimilarities between Data Objects, Similarities between Data Objects, Examples of Proximity Measures.	8 Hours
MODULE - III	
Association Analysis: Basic Concepts and Algorithms - Problem Definition; Frequent Itemset Generation; Rule Generation; Compact Representation of Frequent Itemsets; Alternative Methods for Generating Frequent Itemsets; FP-Growth Algorithm; Evaluation of Association Patterns – Objective Measures of Interestingness.	8 Hours
MODULE - IV	
Classification: Preliminaries; General Approach to Solving a Classification Problem; Decision Trees Induction; Method for Comparing Classifiers; Rule-Based Classifier; Nearest Neighbor Classifiers; Bayesian Classifiers.	8 Hours
MODULE - V	
Cluster Analysis: Basic Concepts and Methods – Cluster Analysis: What is Cluster Analysis?, Requirements for Cluster Analysis, Overview of Basic Clustering Methods; Partitioning Methods - k-Means: A Centroid-Based Technique, k-Medoids: A Representative Object-Based Technique; Hierarchical Methods; Density-Based Methods; Evaluation of Clustering.	8 Hours
COURSE OUTCOMES	



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

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Describe the data warehouse and OLAP technology for understanding the overall data mining and knowledge discovery process.	CL2
CO2	Discuss the implementation aspects of the data warehouse and illustrate the importance of data for the mining process.	CL3
CO3	Determine the frequent itemset and association rules for discovering important relationships hidden in large data sets.	CL2
CO4	Use the different classification techniques to solve diverse applications	CL2
CO5	Apply the concepts of clustering for understanding data and solving different practical problems.	CL2

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2								2	2	2
CO2	3	3	2	2								2	3	3
CO3	3	3	3	3	3	2					2	2	3	2
CO4	3	3	3	3	3	2					2	2	3	3
CO5	3	3	3	3	3	2					2	2	3	3
3: Substantial (High)					2: Moderate (Medium)					1: Poor (Low)				

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Student's learning will be assessed using Direct and Indirect methods.

Sl.	Assessment Description	Weightage (%)	Max. Marks
1	Continuous Internal Assessment	100 %	50
	Continuous Internal Evaluation (CIE)	60 %	30
	Assignments	40 %	20
2	Semester End Examination (SEE)	100 %	50

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)
Continuous Internal Evaluation (CIE) (60%)			Assignment/ Activities (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage



40%	30%	30%	100%	100%
M I			M I	M I
M II			M II	M II
	M III		M III	M III
	M IV	M IV	M IV	M IV
		M V	M V	M V

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer-to-Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands.

SEE Question Paper Pattern:

- The question paper will have **TEN** full questions from **FIVE** Modules.
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer **FIVE** full questions, selecting one full question from each module.

Text Books:

1. Jiawei Han, Micheline Kamber, Jian Pei: Data Mining -Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publisher, 2012.



2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson, First impression, 2014.

Reference Books:

1. Sam Anahory, Dennis Murray: Data Warehousing in the Real World, Pearson, Tenth Impression, 2012.
2. Michael.J.Berry, Gordon.S.Linoff: Mastering Data Mining, Wiley Edition, Second Edition, 2012.

Reference Web Links And Video Lectures (E-Resources):

1. https://onlinecourses.swayam2.ac.in/cec20_cs12/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs06/preview



**INTRODUCTION TO ARTIFICIAL INTELLIGENCE
AND MACHINE LEARNING
(Effective from the Academic Year 2023 - 2024)
VII SEMESTER**

Course Code	21IS744	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03

CREDITS – 3

COURSE PREREQUISITES:

- Fundamental knowledge of Mathematics concepts like probability.

COURSE OBJECTIVES:

- To Gain a historical perspective of AI and its foundations
- To understand the basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
- To describe Artificial Intelligence and Machine Learning algorithms and evaluate their performance
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To Illustrate AI and ML algorithm and their use in appropriate applications.
- To Describe the applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models
- To apply the classification, clustering and regression-based machine learning algorithms techniques to solve real time problems.
- To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents



COURSE CONTENTS		
MODULE - I		
What is artificial intelligence? AI Problems, what is AI technique Problems. Problem spaces and search: Defining the problem as a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in design of search programs		8 Hours
MODULE - II		
Heuristic search techniques: Generate and Test, Hill Climbing, Best First Search, Problem Reduction. Knowledge representation issues: Representation and Mapping, Approaches to Knowledge Representation.		8 Hours
MODULE - III		
Introduction: Machine Learning, Types of Machine Learning, Main challenges of Machine Learning, Testing and Validating. Concept Learning tasks, Concept Learning as search, Find S algorithm, Version Spaces and Candidate Elimination algorithm. Decision Tree Learning: Introduction, Decision tree representation, Appropriate problems, ID3algorithm.		8 Hours
MODULE - IV		
Artificial Neural Network: Introduction, Neural Network representation, Appropriate problems, Perceptron, Back propagation algorithm. Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naïve Bayes Classifier.		8 Hours
MODULE - V		
Instance-Based Learning: Introduction, k Nearest Neighbor Learning, locally weighted regression, Radial basis function, Case-Based reasoning. Reinforcement Learning: Introduction, The learning task, Q-Learning.		8 Hours
COURSE OUTCOMES		
Upon completion of this course, the students will be able to:		
CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Illustrate the theory of artificial intelligence for various problem-solving techniques.	CL3
CO2	Apply artificial intelligence concepts in Heuristic Search Techniques and knowledge representation.	CL3
CO3	Examine a wide variety of learning algorithms and apply Decision tree learning algorithm for the data.	CL3



CO4	Apply the concept of neural networks for learning linear and non-linear activation functions and Bayesian classifier to label data.	CL3
CO5	Illustrate instant based and reinforcement learning algorithms and identify its applicability in real life problems.	CL3

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40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

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TEXT BOOKS:

1. Elaine Rich, Kevin Kand S B Nair, “**Artificial Intelligence**”, 3rd Edition, McGraw Hill Education, 2017.
2. Tom M Mitchell, “**Machine Learning**”, 1st Edition, McGraw Hill Education, 2017.
3. Aurelien Geron, Hands-on Machine Learning with Scikit-Learn & TensorFlow, O’Reilly Media Publications, 3rd Edition, 2022, ISBN: 978-93-5542-198-2.
4. Saroj Kaushik, Artificial Intelligence, Cengage learning.
5. Stuart Rusell, Peter Norving, Artificial Intelligence: A Modern Approach, Pearson Education 2nd Edition.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. <https://www.youtube.com/watch?v=wnqkfpCpK1g>
2. <https://www.youtube.com/watch?v=t4K6lney7Zw>