



**PPSU**

**P P SAVANI UNIVERSITY**

**SCHOOL OF ENGINEERING**

**M. Sc. (COMPUTER SCIENCE)**

**SYLLABUS BOOK**

**AY 2025-26**

### INSTITUTE VISION

To emerge as an Institute of Excellence by imparting value-based education aided with Research, Innovation and Entrepreneurial skills.

### INSTITUTE MISSION

1.	To impart the holistic engineering education of highest quality & prepare socially responsible professionals with entrepreneurial skills.
2.	To prepare value-aided engineering professionals to meet up global industry requirements by imparting cutting edge professional education.
3.	To inculcate the attitude of research and innovation among the stake holders through experiential and project-based teaching-learning pedagogy.
4.	To acquire global talent pool by providing world class amenities for teaching, learning & research.

Graduates will demonstrate ability to:

PEO No	PROGRAMME EDUCATIONAL OBJECTIVES
PEO 1	Lead complex software development projects and deliver enterprise grade solutions by applying advanced computing knowledge and strategic project management skills.
PEO 2	Excel in senior technical roles such as software architects, project managers, or IT consultants by demonstrating strong analytical, leadership, and communication capabilities in industry or entrepreneurship.
PEO 3	Contribute to technological innovation through lifelong learning, applied research, or doctoral studies, continuously adapting to advancements in computing and the software industry.

<b>PO No</b>	<b>PROGRAMME OUTCOMES</b>
PO 1	Apply advanced knowledge of computing principles, algorithms, mathematics, and domain-specific concepts to model and solve complex computing problems.
PO 2	Analyse complex technical problems and propose efficient, scalable, and innovative computing solutions using appropriate methodologies and technologies.
PO 3	Design, develop, test, deploy, and maintain reliable software applications and platforms using modern development practices, tools, and quality standards.
PO 4	Conduct systematic research, experimentation, and critical analysis to develop innovative solutions and contribute meaningfully to knowledge creation in computing.
PO 5	Apply data analytics, artificial intelligence, machine learning, cloud computing, and cybersecurity to address real-world challenges effectively and responsibly.
PO 6	Leverage advanced computing tools and frameworks to address interdisciplinary problems spanning healthcare, finance, smart systems, and business domains.
PO 7	Exhibit professional ethics, effective communication, collaborative teamwork, and leadership while upholding social responsibility in professional and research settings.
PO 8	Commit to continuous learning, adapt to technological advancements, and pursue ongoing professional development, research growth, and innovation throughout the career.

<b>PSO No</b>	<b>PROGRAMME SPECIFIC OUTCOMES (PSO)</b> <b>M. Sc. COMPUTER SCIENCE</b>
PSO 1	Graduates will apply fundamental principles and methodologies of computer science across diverse application domains, designing and implementing well documented solutions to significant computational problems.
PSO 2	Graduates will analyse and formulate solutions to real world and socially relevant problems by leveraging data science and machine learning concepts and techniques.
PSO 3	Graduates will emerge as technically skilled professionals, researchers, and entrepreneurs, fully equipped to excel in competitive examinations and pursue doctoral or advanced academic pursuits.

<b>Credit Guidelines (General)</b>			
<b>Component</b>	<b>Hour/Week</b>	<b>Credit</b>	<b>Total Hours/Semester</b>
Theory	1	1	15
Practical	2	1	30
Tutorial	1	1	15
Note: In specific cases; extra credits can be granted for specific/important subjects.			

**CO-PO Mapping Guidelines**

<b>Mapping Level</b>	<b>% age Mapping</b>	<b>Indicator</b>
0 / -	0	No Mapping
1	0-33	Low Level (Slightly Mapped)
2	33-66	Medium Level (Moderately Mapped)
3	>66	High Level (Strongly Mapped)

# Syllabus Book

## Master of Science (Computer Science)



**P P Savani University**  
School of Engineering

Effective From: 2025-26  
Authored by: P P Savani University

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# FIRST YEAR M.SC.(CS)

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**P P SAVANI UNIVERSITY**

**SCHOOL OF ENGINEERING**

**INSTITUTE OF COMPUTER SCIENCE & APPLICATION**

**TEACHING & EXAMINATION SCHEME FOR M. Sc. (COMPUTER SCIENCE) PROGRAMME AY: 2025-26**

Sem	Course Code	Course Title	Offered By	Teaching Scheme				Examination Scheme							
				Contact Hours				Credit	Theory		Practical		Tutorial		Total
				Theory	Practical	Tutorial	Total			CE	ESE	CE	ESE	CE	
1	ICSH7010	Discrete Mathematics	SH	03	-	02	05	05	40	60	-	-	100	00	200
	ICCA7010	Programming Concepts	CA	03	02	-	05	04	40	60	40	60	-	-	200
	ICCS7010	Information Security & Applications	CS	03	02	-	05	04	40	60	40	60	-	-	200
	ICCA7020	Programming with Python	CA	03	02	-	05	04	40	60	40	60	-	-	200
	ICCS7020	Computer Architecture	CS	03	-	-	03	03	40	60	-	-	-	-	100
	CFLS7110	Professional & Academic Communication	CFLS	03	-	-	03	03	100	00	-	-	-	-	100
						<b>Total</b>	<b>26</b>	<b>23</b>							<b>1000</b>
2	ICCA7030	Python Web Development	CA	-	04	-	04	02	-	-	40	60	-	-	100
	ICCA7041	Java Web Technologies	CA	03	02	-	05	04	40	60	40	60	-	-	200
	ICCS7030	Advanced Cloud Computing	CS	02	02	-	04	03	40	60	40	60	-	-	200
	ICCA7050	Relational Data Engineering	CA	03	02	-	05	04	40	60	40	60	-	-	200
	ICCS7040	Software Quality & Assurance	CS	03	-	01	04	04	40	60	-	-	100	00	200
	ICCS7910	Project-I	CS	-	10	-	10	10	-	-	80	120	-	-	200
						<b>Total</b>	<b>32</b>	<b>27</b>							<b>1100</b>

**P P Savani University**  
**School of Engineering**

**Department of Science & Humanities**

Course Code: ICSH7010

Course Name: Discrete Mathematics

Prerequisite Course(s): --

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	02	05	40	60	-	-	100	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- Extend concepts of set theory by the study of relation and lattice.
- Illustrate mathematical logic with various techniques of program verification.
- Apply knowledge of discrete mathematics for problem-solving skills necessary to succeed in the design and analysis of algorithms, database management, software engineering, and computer networks.

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Set, Relation &amp; Function</b> Sets, Set operations, Introduction of Relations, Relations of Sets, Types of Relations, Properties of Relations, Equivalence Relation, Partial Ordering, Hasse Diagram, GLB & LUB, Functions, Classification of functions, Types of functions	08	17
2.	<b>Introduction to Probability</b> Experiments, Counting Rules, Assigning Probabilities, Events and their Probabilities, Relationships of Probabilities, Conditional Probability, Bayes' Theorem	07	16
3.	<b>Matrix Algebra</b> Elementary Row and Column operations, Inverse of matrix, Rank of matrix, System of Linear Equations, Characteristic Equation, Eigen values and Eigen vector, Diagonalization, Cayley Hamilton Theorem.	08	17
4.	<b>Graph Theory</b> Graphs and Graph Models, Graph Terminology and Types of graphs, Representing graphs and Isomorphism, Connectivity, Euler and Hamilton Paths-Circuits, Applications of weighted graphs.	11	25
5.	<b>Tree</b> Introduction to Trees, Rooted Tree, Properties of tree, Binary tree, Tree Traversal, Spanning Tree, DFS, BFS, Minimum Spanning Tree,	11	25

	Prim's Algorithm, Kruskal's Algorithm.		
	<b>TOTAL</b>	<b>45</b>	<b>100</b>

**List of Tutorial(s):**

<b>Sr. No.</b>	<b>Name of Tutorials</b>	<b>Hours</b>
1.	Problems based on Set, Relation & Function-1	2
2.	Problems based on Set, Relation & Function-2	2
3.	Problems based on Set, Relation & Function-3	2
4.	Problems based on Introduction to Probability	4
5.	Problems based on Matrix Algebra-1	2
6.	Problems based on Matrix Algebra-2	4
7.	Problems based on Graph Theory-1	2
8.	Problems based on Graph Theory-2	2
9.	Problems based on Graph Theory-3	4
10.	Problems based on Tree-1	2
11.	Problems based on Tree-2	4
	<b>TOTAL</b>	<b>30</b>

**Text Book(s):**

<b>Title</b>	<b>Author/s</b>	<b>Publication</b>
Discrete Mathematics and its Applications	Kenneth Rosen	McGraw Hill, New York.
Thomas' Calculus	George B. Thomas, Maurice D. Weir and Joel Hass	Pearson

**Reference Book(s):**

<b>Title</b>	<b>Author(s)</b>	<b>Publication</b>
A Textbook of Discrete Mathematics	Dr. Swapan Kumar Sarkar	S. Chand & Company Ltd., New Delhi.
Discrete Mathematical Structure with Applications to Computer Science	J.P.Trembly, R. Manohar	Tata McGraw-Hill Publishing Company Ltd. New Delhi.
Graph Theory with Applications to Engineering and Computer Science	Narsingh Deo	PHI Learning Pvt. Ltd. New Delhi.

**Web Material Link(s):**

- [https://onlinecourses.nptel.ac.in/noc25\\_cs26/preview?](https://onlinecourses.nptel.ac.in/noc25_cs26/preview?)

**Course Evaluation:****Theory:**

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

**Tutorial:**

- Continuous Evaluation consists of the performance of tutorial which will be evaluated out of 10 marks for each tutorial and average of the same will be converted to 50 marks.
- Assignment consists of 20 marks.
- Internal viva consists of 30 marks.

**Course Outcome(s):**

After completion of the course, the students will be able to

<b>ICSH7010</b>	<b>DISCRETE MATHEMATICS</b>
CO 1	Summarize the concepts of set theory for understanding & fetching data from a database using query.
CO 2	Evaluate linear system using matrices and the knowledge of eigenvalues and eigenvectors for matrix diagonalization
CO 3	Classify the basic concepts of spanning tree algorithms namely DFS, BFS, prim's and kruskal's in the design of networks.
CO 4	Combine the design, foundational concepts of notations and results of graph theory used for better understanding of problems.

**Mapping of CO with PO**

<b>ICSH7010</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>
CO 1	2	2	1	1				1
CO 2	3	3	1	1				3
CO 3	3	3	1	1				3
CO 4	3	3	1	1				3

**Mapping of CO with PSO**

<b>ICSH7010</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
CO 1	1	2	
CO 2	3	2	3
CO 3	2	2	
CO 4	3	1	2

### Level of Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

<b>Module No</b>	<b>Content</b>	<b>RBT Level</b>
1.	Set, Relation & Function	1,2,4,6
2.	Introduction to Probability	2,3,5
3.	Matrix Algebra	1,2,3,4,5,6
4.	Graph Theory	1,2,3,5,6
5.	Tree	1,2,3,5,6

**P P Savani University**  
**School of Engineering**  
**Institute of Computer Science and Application**

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**Department of Computer Application**

Course Code: ICCA7010

Course Name: Programming Concepts

Prerequisite Course(s): --

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- understand the mechanisms that inspire and guide the design and implementation of Programming Languages
- understand the importance of object-oriented approach.
- develop expertise in creating robust applications using the Java Programming Language.

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Procedural Programming Paradigm:</b> Language Evaluation Criteria, influences on Language design, Language categories, Programming Paradigms, Programming Language Implementation – Compilation and Virtual Machines, programming environments. Algorithm & Flowchart basics Know about the basic fundamentals of Java programming. Acquire knowledge about the storage classes, arrays and structures pointers	08	15
2.	<b>Data Types Arrays Pointers Loops Concept</b> Data types: primitive, character, user defined, array, associative, record, union, Pointer and reference types, Names, Variable, concept of binding, type checking, strong typing, type compatibility, named constants, variable initialization. Sequence control with Expressions, Conditional Statements, Loops, Exception handling. Difference between OOP and Procedure Oriented Programming	03	10
3.	<b>Object Oriented Programming</b> Classes, objects, Characteristics of OOP, Mutator and Accessor methods, defining your own classes, static fields and methods,		

	method parameters, object construction, polymorphism, final class and methods, casting abstract classes and, protected access, Object: Cosmic superclass, Object Wrappers and Autoboxing and Enumeration classes. Interface.	07	15
4.	<b>Java Programming</b> Introduction, Features of Java, Comparing Java and other languages, Java Development Kit, More Complex Programs, Java Source file structure, Prerequisites Java Language Fundamentals - The building Blocks of Java. Packages, Importing Packages, Java's Class Library	06	10
5.	<b>Multithreading and Exception Handling.</b> Multithreaded Programming - Multithreading Fundamentals, The Thread Class and Runnable Interface, creating a Thread, Creating Multiple Threads, Thread Priorities, Synchronization, , Exception Handling	06	15
6.	<b>Input/ Output Streams:</b> reading writing bytes, combining IO steam files, Text Input and Output: write text output, read text output, saving object in text format, character encoding, Reading and Writing, Working with Files: reading and writing files, creating files and directories, copying, moving and deleting files and getting file information	04	10
7.	<b>JDBC</b> The Design of JDBC, JDBC Driver Types, SQL, JDBC Configuration: URL, driver jar files, starting the database, registering the driver class, connecting to the database, Working with JDBC Statements: executing SQL statement, managing connections, statements, resultsets, SQL exceptions, Query Execution: prepared statement.	04	10
8.	<b>The SWING &amp; Collection Framework</b> The Collection framework The collection class, Array list and Link list classes (maintaining the capacity and the link list class ), SWING Framework ,Understanding Layout Managers - Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout, The Swing Packages, A Simple Swing Application, differentiate Swing & Applet,	07	15
	<b>TOTAL</b>	<b>45</b>	<b>100</b>

**List of Practical:**

Sr. No	Name of Practical	Hours
1.	Working with practical concepts of procedural paradigm	04
2.	Implementation of basic concepts of java fundamentals – data types, classes, objects, operators, control & looping structures.	02
3.	Implementation of compile time polymorphism.	02
4.	Implementation of Inheritance.	02
5.	Implementation of runtime polymorphism (overriding & dynamic method dispatch).	02
6.	Implementation of user defined packages.	02

7.	Implementation of thread and different methods and mechanisms.	02
8.	Implementation of exception handling.	02
9.	Implementation of user defined exception handling.	02
10.	Implementation of various file operations using different streams, classes and methods.	02
11.	Implementation of database connectivity using JDBC.	04
12.	Implementation of various collection framework classes and utility.	02
13.	Implementation of SWING Framework	02
	<b>TOTAL</b>	<b>30</b>

**Text Book (s):**

Title	Author/s	Publication
The complete reference Java	Herbert Schildt	Mc Grow Hill

**Reference Book (s):**

Title	Author/s	Publication
The class of Java	Pravin Jain	Pearson Education
Core Java, Volume 1-Fundamental	Cay S. Horstmann and Gary Cornell	Pearson Education
Object Oriented Programming through Java	P. Radha Krishna	Universities Press
Object-Oriented Programming with Java: Essentials & Applications	Raj Kumar Buyya, S. ThamaraiSelvi, & Xing Chen Chu	Tata McGraw Hill

**Web Material Link(s):**

- [https://onlinecourses.nptel.ac.in/noc22\\_cs47/preview](https://onlinecourses.nptel.ac.in/noc22_cs47/preview)
- <https://inventwithpython.com/hacking/chapters>

**Course Evaluation:**

**Theory:**

- Continuous Evaluation consists of two tests of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination consists of 60 marks.

**Practical:**

- Continuous Evaluation consists of the performance of practical, which will be evaluated out of 10 marks per each practical and average of the entire practical will be converted to 20marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/test consists of 30 marks during End Semester Examination.
- Viva/Oral performance consists of 30 marks during End Semester Examination.

**Course Outcome(s):**

<b>ICCA7010</b>	<b>Programming Concepts</b>
CO 1	Learn and acquire principles of object-oriented programming concepts and its application using java programming.
CO 2	Identify syntax, semantics, data types, conditional statements, control structures, and arrays and strings in java programming language.
CO 3	Explain building blocks of java environment, concept of polymorphism, inheritance, abstraction and interfaces and construct programs in java.
CO 4	Define and describe the role of packages and exception handling for access protection, name space management and reliability of code.
CO 5	Recognize multithreading for exploring concurrency and applets for basic graphical user interface in java.

**Mapping of CO with PO**

<b>ICCA7010</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>
CO 1	1	1				1	1	1
CO 2	1	1	1					
CO 3	2	2	1					
CO 4	2	2	2					
CO 5	2	2	2		1	1	1	3

**Mapping of CO with PSO**

<b>ICCA7010</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
CO 1	1		
CO 2	3		
CO 3	2	2	
CO 4	3	2	
CO 5	3	2	1

**Level of Bloom's Revised Bloom's Taxonomy in Assessment**

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

<b>Module No</b>	<b>Content</b>	<b>RBT Level</b>
<b>1</b>	Procedural Programming Paradigm:	1, 2
<b>2</b>	Data Types Arrays Pointers Loops Concept	1, 2, 3
<b>3</b>	Object Oriented Programming	2, 3,4
<b>4</b>	Java Programming	2, 5,6
<b>5</b>	Multithreading and Exception Handling	2,4,5
<b>6</b>	Input/ Output Streams	2,3,6
<b>7</b>	JDBC	2,3,4
<b>8</b>	The SWING & Collection Framework	3,5,6

**P P Savani University**  
**School of Engineering**  
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**Department of Computer Science**

Course Code: ICCS7010

Course Name: Information Security & Applications

Prerequisite Course(s): --

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- Learn fundamentals of cryptography and its application to network security.
- Understand network security threats, security services, and countermeasures.
- Understand vulnerability analysis of network security
- Acquire background on hash functions; authentication; firewalls; intrusion detection techniques.

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Introduction to Information Security:</b> Information Security Understanding, Vulnerability, Security Goals, Security Services and mechanisms	04	10
2.	<b>Conventional Cryptographic Techniques:</b> Modular arithmetic, linear congruence, checking of primness, quadratic congruence, Conventional substitution and transposition ciphers, One-time Pad, Block cipher and Stream Cipher, Steganography	08	20
3.	<b>Symmetric and Asymmetric Cryptographic Techniques:</b> Data Encryption Standards, Advanced Encryption standards, Electronic code book mode, CBC, Cipher feedback mode, AES, RSA algorithms	08	20
4.	<b>Message Authentication and Digital Signatures:</b> Use of Cryptography for authentication requirements, Message Authentication Code (MAC), Secure Hash function, Key management – Kerberos	07	15
5.	<b>Program Security:</b>	09	17

	Non malicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels		
6.	<b>Security in Networks:</b> Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP, S/MIME	09	18
	<b>TOTAL</b>	<b>45</b>	<b>100</b>

#### List of Practical:

Sr. No	Name of Practical	Hours
1.	Implement Ceaser Cipher	1
2.	Implement Playfair Cipher with key entered by user.	2
3.	Implement polyalphabetic & Hill Cipher	2
4.	Implement Rail fence technique	2
5.	Implement Simple Columner Transposition technique	2
6.	Implement Simple RSA Algorithm with small numbers.	2
7.	Implement Simplified DES	2
8.	Make a study of one IDS (For ex. Snort)	2
	<b>TOTAL</b>	<b>15</b>

#### Text Book (s):

Title	Author/s	Publication
Security in Computing, Fourth Edition	Charles P. Pfleeger	Pearson Education

#### Reference Book (s):

Title	Author/s	Publication
Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition	William Stallings	Pearson
Modern Cryptography: Theory and Practice	Wenbo Mao	Prentice Hall
Network Security Essentials: Applications and Standards	William Stallings.	Prentice Hall

#### Web Material Link(s):

- <https://www.geeksforgeeks.org/network-security/>
- <https://archive.nptel.ac.in/courses/106/106/106106129/>

#### Course Evaluation:

##### Theory:

- Continuous Evaluation consists of two tests of 30 marks and 1 hour of duration and average of the

same will be converted to 30 marks.

- Faculty evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination consists of 60 marks.

#### Practical:

- Continuous Evaluation consists of performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/drawing/test consists of 30 marks during End Semester Exam.
- Viva/Oral performance consists of 30 marks during End Semester Exam.

#### Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

ICCS7010	INFORMATION SECURITY & APPLICATIONS
CO 1	Define fundamental security goals and identify vulnerabilities, services, and mechanisms within an information system.
CO 2	Apply modular arithmetic and classical cryptographic techniques to solve substitution and transposition cipher problems.
CO 3	Contrast symmetric and asymmetric algorithms (DES, AES, RSA) and evaluate their various block cipher modes of operation.
CO 4	Implement message authentication codes, hash functions, and digital signatures to ensure data integrity and secure key management.
CO 5	Analyze program-level threats and network security architectures, including firewalls, IDS, and secure email protocols.

#### Mapping of CO with PO

ICCS7010	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	3	2				1		
CO 2	3	3	2	2				
CO 3	3	3	2	2	2			
CO 4	2	2	3	3				2
CO 5	2	3	3	3	3	2	1	2

#### Mapping of CO with PSO

ICCS7010	PSO1	PSO2	PSO3
CO 1	2	1	2
CO 2	3		3
CO 3	3	2	3
CO 4	3	2	3
CO 5	3	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

<b>Module No</b>	<b>Content</b>	<b>RBT Level</b>
<b>1</b>	Introduction to Information Security	1,2
<b>2</b>	Conventional Cryptographic Techniques	1,2,3
<b>3</b>	Symmetric and Asymmetric Cryptographic Techniques	2,3,5,6
<b>4</b>	Authentication and Digital Signatures	4,5,6
<b>5</b>	Program Security	1,2,4
<b>6</b>	Security in Networks	2,3,5

**P P Savani University**  
**School of Engineering**  
**Institute of Computer Science and Application**  


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**Department of Computer Application**

Course Code: ICCA7020

Course Name: Programming with Python

Prerequisite Course(s): -

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	00	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- To provide a strong foundation in Python programming concepts and practices.
- To equip students with the ability to design, develop, and deploy Python-based applications.
- To enhance problem-solving and analytical skills using Python for real-world applications.
- To introduce advanced programming techniques, including object-oriented programming, web frameworks, and data science libraries.
- To prepare students for careers in software development, data science, and machine learning.

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Introduction to Python Programming</b> Overview of Python: History, features, and applications. Setting up Python Environment: Installation, IDEs, and tools. Basic Syntax and Structure: Keywords, identifiers, comments, and indentation. Variables and Data Types: Numbers, strings, and Booleans. Operators and Expressions: Arithmetic, logical, comparison, bitwise, and assignment operators. Control Structures: Conditional statements (if, elif, else) and loops (for, while). Input and Output Handling: Using input(), print(), and formatting output.	07	15%
2.	<b>Data Structures and Algorithms in Python</b> Sequences: Lists, tuples, and ranges. Sets and Dictionaries: Creation, manipulation, and comprehension. Advanced Data Structures: Stacks, queues, and linked lists with implementation. Algorithms: Searching (linear and binary) and sorting (bubble, insertion, merge). Recursion: Basics and problem-solving techniques.	08	20%
3.	<b>Object-Oriented Programming (OOP) in Python</b> Classes and Objects: Defining and using classes and objects. Inheritance: Single, multiple, and multilevel inheritance. Polymorphism: Method overloading and overriding. Encapsulation: Access specifiers and data hiding. Abstraction: Interfaces and abstract classes. Exception Handling: try, except, finally, and custom exceptions. File Handling: Reading, writing, appending, and binary file operations. Serialization: Pickle and JSON libraries for data storage.	07	15%

4.	<b>Advanced Python Concepts</b> Advanced Python Concepts Iterators and Generators: Itertools module and generator expressions. Decorators: Function decorators and class decorators. Context Managers: Using 'with' statements and custom context managers. Lambda Functions: Anonymous functions and map-reduce. Regular Expressions: Pattern matching with re module. Multithreading and Multiprocessing: Thread synchronization and parallel processing.	07	20%
5.	<b>Database Programming and Web Development</b> Database Connectivity: SQLite and MySQL setup and connection. CRUD Operations: Insert, update, delete, and fetch. Web Frameworks: Flask and Django for web development. RESTful APIs: Creating APIs with Flask. Web Scraping: Data extraction using BeautifulSoup and requests library.	08	15%
6.	<b>Data Science and Machine Learning Basics</b> Data Manipulation: NumPy and Pandas for arrays and data frames. Data Visualization: Matplotlib and Seaborn for charts and plots. Machine Learning Basics: Introduction to supervised and unsupervised learning. Scikit-Learn: Implementation of classification and regression models. Tools and Platforms: Working with Jupyter Notebook and Google Colab.	06	15%
<b>TOTAL</b>		<b>45</b>	<b>100</b>

#### List of Practical:

Sr. No	Name of Practical	Hours
1.	Implement a program to sort a list using Bubble Sort and Merge Sort.	02
2.	Develop a Calculator Application with GUI using Tkinter.	04
3.	Implement Linked List operations (Insert, Delete, Search).	02
4.	Design a student database management system using SQLite.	02
5.	Develop a Python script for File Handling operations (read, write, append).	04
6.	Build a web scraper to extract data from a website.	04
7.	Implement a simple API in Flask for user authentication.	04
8.	Perform Data Analysis and Visualization using Pandas and Matplotlib.	02
9.	Develop a program for Text Classification using Scikit-Learn.	04
10.	Create a program that uses Multithreading to process files.	02
<b>TOTAL</b>		<b>30</b>

#### Text Book (s):

Title	Author/s	Publication
Python Programming: An Introduction to Computer Science	John Zelle, Franklin, Beedle & Associates Inc.	Beedle & Associates Inc.

#### Reference Book (s):

Title	Author/s	Publication
Programming Python	Mark Lutz	O'Reilly Media
Python Crash Course	Eric Matthes	No Starch Press
Core Python Programming	Wesley J. Chun	Pearson Education

**Web Material Link(s):**

- <https://docs.python.org/3/>
- <https://www.coursera.org/specializations/python>
- [https://onlinecourses.swayam2.ac.in/cec22\\_cs20/preview](https://onlinecourses.swayam2.ac.in/cec22_cs20/preview)

**Course Evaluation:****Theory:**

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

**Practical:**

- Continuous Evaluation consists of the performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/test consists of 30 marks during End Semester Exam.
- Viva/oral performance consists of 30 marks during the End Semester Exam.

**Course Outcome(s):**

After the completion of the course, the following course outcomes will be able to:

ICCA7020	PROGRAMMING WITH PYTHON
CO 1	Understand fundamental concepts and syntax of Python programming.
CO 2	Implement efficient data structures and algorithms for solving problems.
CO 3	Design modular and reusable code using OOP principles.
CO 4	Develop applications leveraging databases, web frameworks, and APIs.
CO 5	Apply Python libraries for data analysis, visualization, and machine learning.

**Mapping of CO with PO**

ICCA7020	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	1	2	1	2		2		3
CO 2	3	3	3	3	1		2	3
CO 3	2			2		2		2
CO 4	1			2		2	2	2
CO 5	1	3	3	3				

**Mapping of CO with PSO**

ICCA7020	PSO1	PSO2	PSO3
CO 1	3	3	3
CO 2	3	3	1
CO 3			3
CO 4			
CO 5		3	3

**Level of Bloom's Revised Bloom's Taxonomy in Assessment**

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

<b>Module No</b>	<b>Content</b>	<b>RBT Level</b>
<b>1</b>	Introduction to Python Programming	1,2,3
<b>2</b>	Data Structures and Algorithms in Python	2,3,6
<b>3</b>	Object-Oriented Programming (OOP) in Python	2,3,6
<b>4</b>	Advanced Python Concepts	3,6
<b>5</b>	Database Programming and Web Development	2,3,5,6
<b>6</b>	Data Science and Machine Learning Basics	6

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**Department of Computer Application**

Course Code: ICCS7020

Course Name: Computer Architecture

Prerequisite Course(s): --

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	-	03	40	60	-	-	-	-	100

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- Have a understanding of Digital systems and operation of a digital computer.
- Learn different architectures & organizations of memory systems and processor organization
- Understand the working principles of multiprocessor and parallel organization's as advanced computer architectures

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Fundamentals of Digital Logic and Data Representation</b> Boolean Algebra, Logic Gates, Simplification of Logic Circuits: Algebraic Simplification, Karnaugh Maps, Combinational Circuits: Adders, Multiplexers (Mux), De-Multiplexers (De-Mux), Sequential Circuits: Flip-Flops (SR, JK & D), Counters and Registers, Data Representation: Decimal, Binary, Octal, and Hexadecimal numbers; Binary Arithmetic and Error Detection Codes (Parity, Hamming Code).	10	20
2.	<b>Computer System</b> Comparison of Computer Organization & Architecture, Computer Components and Functions, Accessing Input/Output Devices, Interrupts and Interrupt Handling Mechanisms, Data Transfer Schemes - Programmed I/O, DMA Transfer, Data Transfer Schemes for Microprocessors, Bus Structures and Communication.	08	15
3.	<b>Memory System Organization</b> Memory Hierarchy, Primary Memory (RAM, ROM), Secondary Memory: Magnetic Tape, Magnetic Disk, Optical Disk, Magneto-Optical Disk; Concepts of Auxiliary, Associative, Cache, and Virtual Memory, External Memory: Magnetic Discs, Optical Memory, Flash Memories, RAID Levels and their Applications	06	15
4.	<b>Processor Organization</b>	10	20

	Instruction Formats, Instruction Sets, Addressing Modes, Addressing Modes Examples with Assembly Language [8085/8086 CPU], Processor Organization, Structure, and Function, Register Organization, Instruction Cycle, Instruction Pipelining, Introduction to RISC and CISC Architecture, Instruction Level Parallelism and Superscalar Processors: Design Issues; Control Unit Design: Hardwired vs Microprogrammed Control.		
5.	<b>Fundamentals of Advanced Computer Architecture</b> Parallel Architecture: Classification of Parallel Systems, Flynn's Taxonomy, Array Processors, Clusters, and NUMA Computers, Multiprocessor Systems: Structure & Interconnection Networks; Multi-Core Computers: Introduction, Organization, and Performance; Pipeline and Vector Processors.	07	15
6.	<b>Case Study</b> Pentium 4 Processor Organization and Architecture, Comparative Analysis of Modern Processors (e.g., Intel Core, AMD Ryzen), Emerging Trends in Processor Design and Performance Enhancement	04	15
	<b>TOTAL</b>	<b>45</b>	<b>100</b>

**Text Book (s):**

Title	Author/s	Publication
Modern Digital Electronics	R.P. Jain	Tata McGraw Hill

**Reference Book (s):**

Title	Author/s	Publication
Computer Organization & Architecture	William Stallings	Pearson Education
Computer System Architecture	M. Morris Mano	Pearson Education.

**Web Material Link(s):**

- <https://nptel.ac.in/courses/106/105/106105163/>
- [web.stanford.edu/class/ee282/](http://web.stanford.edu/class/ee282/)

**Course Evaluation:**

**Theory:**

- Continuous Evaluation consists of two tests each of 30 marks and 1 hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

**Course Outcome(s):**

After the completion of the course, the following course outcomes will be able to:

ICCS7020	COMPUTER ARCHITECTURE
CO1	Understand the core concepts of digital logic design like number base representation, Boolean algebra etc.
CO2	Classify the various architectural concepts to optimize and enhance the classical von Neumann architecture into high performance computing hardware systems.
CO3	Analyze the performance and structural configurations of parallel architectures, including Flynn's Taxonomy, multi-core systems, and interconnection networks.
CO4	Develop the ability to design, simplify, and implement combinational and sequential circuits using K-Maps and Flip-Flops.
CO 5	Identify, compare and assess issues related to memory, control and I/O functions.

**Mapping of CO with PO**

ICCS7020	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	3	2	1					
CO 2	3	2	2	1				
CO 3	3	3	2	2	2			
CO 4	3	3	3	2	2			
CO 5	3	3	2	2	1			

**Mapping of CO with PSO**

ICCS7020	PSO1	PSO2	PSO3
CO 1	3	1	
CO 2	3	2	1
CO 3	2	2	3
CO 4	3	3	1
CO 5	3	2	2

**Level of Bloom's Revised Bloom's Taxonomy in Assessment**

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Fundamentals of Digital Logic and Data Representation.	1,2,3,4,6
2	Computer System	1,2,3,4,6
3	Memory System Organization	1,2,3,4,6
4	Processor Organization	1,2,3,4,6
5	Fundamentals of Advanced Computer Architecture	1,2,3,4
6	Case Study	1,2,3

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**Department of Computer Application**

Course Code: ICCA7030

Course Name: Python Web Development

Prerequisite Course(s): --

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
-	04	-	02	-	-	40	60	-	-	100

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- To provide foundational knowledge of web technologies and frameworks
- To enable students to design responsive and user-friendly web interfaces to impart servlet technology for writing business logic
- To facilitate students to connect to databases using SQLite

**List of Practical:**

Sr. No	Name of Practical	Hours
1.	Create a simple web server using Python's Flask/Django framework.	02
2.	Design an HTML form and handle form data using Flask/Django.	04
3.	Develop dynamic web pages using Jinja2 templates in Flask.	04
4.	Implement a basic login and registration system using Python.	04
5.	Create a web application with CRUD operations using SQLite/MySQL in Flask/Django.	04
6.	Build and test a REST API for managing data using Flask/Django REST framework.	04
7.	Demonstrate session and cookie management in a Python-based web application.	04
8.	Create a web app that allows users to upload and manage files.	04
9.	Use Bootstrap to design a responsive web interface for a Python web application.	04
10.	Implement AJAX calls in a Python web app to fetch and display data dynamically.	04
11.	Build a basic chat application using Flask-SocketIO.	04
12.	Implement custom error pages and exception handling in a Python web application.	04
13.	Develop a Python web app to send emails using SMTP.	04
14.	Deploy a Flask/Django app on a cloud platform like AWS.	04
15.	Build a web application that integrates web scraping.	06
	<b>TOTAL</b>	<b>60</b>

**Text Book (s):**

Title	Author/s	Publication
Web Technologies	Uttam K Roy	Oxford University Press

**Reference Book (s):**

Title	Author/s	Publication
The Complete Reference PHP	Steven Holzner	TataMcGraw-Hill
Web Programming, building internet applications	ChrisBates2ndedition	WileyDremtech

**Web Material Link(s):**

- <https://nptel.ac.in/courses/106105084>

**Course Evaluation:****Practical:**

- Continuous Evaluation consists of performance of practical which will be evaluated out of 10marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/drawing/test consists of 30 marks during End Semester Exam.
- Viva/Oral performance consists of 30 marks during End Semester Exam.

**Course Outcome(s):**

After the completion of the course, the following course outcomes will be able to:

ICCA7030	PYTHON WEB DEVELOPMENT
CO 1	Understand the core concepts of web application development and modern frameworks like Flask/Django.
CO 2	Design and create responsive, user-friendly web interfaces using HTML, CSS, and Bootstrap.
CO 3	Develop dynamic web applications with backend functionality, including database integration and user authentication.
CO 4	Implement REST APIs, AJAX, and session management for advanced web features.
CO 5	Deploy, test, and debug web applications on cloud platforms and ensure their performance and scalability.

**Mapping of CO with PO**

ICCA7030	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	2	2	2	1	3	2		1
CO 2	3	2	3	2	3	1		1
CO 3	2	2	3	1	3	2		1
CO 4	3	3	3	2	3	2	1	2
CO 5	3	3	3	2	3	2	2	3

**Mapping of CO with PSO**

<b>ICCA7030</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
CO 1		1	
CO 2	3	3	3
CO 3	2		
CO 4			
CO 5	3	3	3

**Level of Bloom's Revised Bloom's Taxonomy in Assessment**

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

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**Department of Computer Application**

Course Code: ICCA7041

Course Name: Java Web Technologies

Prerequisite Course(s): ICCA7010

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- Understand and Implement the Basics of Servlets and JSPs
- Develop Web Applications Using the MVC Architecture
- Leverage JSTL and Expression Language (EL) for Efficient Web Development
- Gain Practical Knowledge of the Spring Framework for Java Web Development

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Servlet API and Overview</b> Servlet Basics, Basic Servlet structure, Servlets Generating text/html content, Packaging Servlets, The servlet life-cycle. Handling Client Request Form Data, Reading Form Data from Servlets, Handling Client Request, Reading Request Headers, Understanding HTTP/1.1 Request Headers, Accessing the Standard CGI Variables Generating the Server Response, HTTP Status Codes, Specifying Status Codes, HTTP / 1.1 Status Codes, Using Redirections, HTTP Response Headers, Setting Response Headers from Servlets, Understanding HTTP / 1.1 Response Headers, Using Servlets to Generate JPEG Images Handling Cookies, Remembering Usernames and Passwords, Deleting Cookies, Sending and Receiving Cookies, Using Cookie Attributes, Differentiating Session Cookies from Persistent Cookies, Session Tracking, Need for Session Tracking, Session Tracking API.	08	15%
2.	<b>Listeners and Filters</b> Using ServletContextListener, HttpSessionListener, Understanding of all the other Listeners viz. ServletRequestListener, ServletContextAttributeListener, ServletRequestAttributeListener, HttpSessionAttributeListener Using Filters for pre and post processing of request.	09	20%

3.	<b>Java Server Pages Overview</b> JSP Basic Syntax, HTML Text, HTML comments, Java Tokens, Template Text, JSP Comment, JSPExpression, JSP Scriptlet, JSP Declaration, JSP Directives, JSP Action, JSP Expression Language Element, Custom Tag (Custom Action), Escaped Template Text, Using JSP Scripting Elements, Using Predefined Variables, XML syntax for Expressions, Scriptlets, Declarations and Directives, Using Scriptlets, Using Declarations, Using Page Directive, Using Standard Actions Tags – <jsp:plugin>, <jsp:forward>, <jsp:include>, Using JavaBeans in JSP pages – <jsp:useBean>, <jsp:getProperty>, <jsp:setProperty>, Sharing Beans, Use of Scopes and their Attributes	08	15%
4.	<b>MVC</b> Integrating Servlets and JSP in a Web Application (MVC Architecture for Web Applications), Implementing MVC with Request Dispatcher, Understanding Data Sharing Between Servlets and JSP, JSP Expression Language, Accessing Scoped Variables, Bean Properties, Collections and Implicit Objects Using EL, Using EL Operators	07	20%
5.	<b>Tag Library</b> Basics; Using JSTL – c:out, c:forEach, c:forTokens, c:if, c:choose, c:set, c:remove, c:import, c:url, c:param, c:redirect and c:catch Tags, REST architecture , REST APIs	06	15%
6.	<b>Introduction to Spring Framework</b> Simplifying Java Development Containing your beans. Surveying the Spring landscape. Wiring Beans. Automatically wiring beans. Wiring Beans with Java. Wiring Beans with XML. Importing and mixing configuration	07	15%
<b>TOTAL</b>		<b>45</b>	<b>100</b>

#### List of Practical:

Sr. No	Name of Practical	Hours
1.	Write a basic servlet to handle HTTP requests and generate HTML content (text/html).	02
2.	Design an HTML form to collect user information (e.g., name, email) and handle the form submission using a servlet.	04
3.	Create a simple login system where the user's session data is stored and accessed on subsequent requests.	04
4.	Implement functionality to set cookies (e.g., "user preferences") and retrieve them in the subsequent user requests. Include setting cookie expiry and deleting cookies.	04
5.	Create a servlet that redirects to another page after form submission, and specify appropriate HTTP status codes (e.g., 302 for redirection).	04
6.	Implement an application where a servlet handles the business logic (Model), and a JSP page is used to display data (View). Use RequestDispatcher for forwarding requests.	04
7.	Create a JSP page that dynamically generates content based on request parameters or session data, and includes scriptlets for embedded Java code.	02

8.	Create a JSP page that uses <c:forEach> to loop through a list and <c:if> for conditional logic. Also, display data using <c:out>.	04
9.	Create a basic Spring application that defines beans in an XML configuration file and demonstrates dependency injection.	02
10.	Create a Spring MVC application that includes a controller, a service layer, and a JSP page for displaying dynamic content. Integrate Spring's DispatcherServlet for handling requests.	02
<b>TOTAL</b>		<b>30</b>

#### Text Book (s):

Title	Author/s	Publication
Core Servlets and JavaServer Pages Volume – 1	Marty Hall, Larry Brown	Pearson

#### Reference Book (s):

Title	Author/s	Publication
Web Technologies Black Book	dreamtech press	dreamtech press
Core Servlets and JavaServer Pages Volume – 2	Marty Hall, Larry Brown	Pearson
Core JSTL	David M Geary	Pearson
Spring in Action	Craig Walls	Manning Publications

#### Web Material Link(s):

- <http://docs.oracle.com/javaee/6/tutorial/doc/bnafd.html>
- [https://onlinecourses.nptel.ac.in/noc22\\_cs47/preview](https://onlinecourses.nptel.ac.in/noc22_cs47/preview)
- [https://onlinecourses.swayam2.ac.in/nou24\\_cs09/preview](https://onlinecourses.swayam2.ac.in/nou24_cs09/preview)
- <https://nptel.ac.in/courses/106105191>

#### Course Evaluation:

##### Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

##### Practical:

- Continuous Evaluation consists of the performance of practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/test consists of 30 marks during End Semester Exam.
- Viva/oral performance consists of 30 marks during End Semester Exam.

#### Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

ICCA7041	JAVA WEB TECHNOLOGIES
CO 1	Understand and implemented real time client server architecture.
CO 2	Design web applications using a servlet, java server pages and jdbc.
CO 3	Examine advanced frameworks and discuss their business applications.
CO 4	Implementation and testing strategies in real time applications.

CO 5	Use advanced concepts related to web services, hibernate and.ejb.
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#### Mapping of CO with PO

ICCA7041	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	1	2	1	2				2
CO 2	1	3	3	3	3			2
CO 3	1			2	2		1	1
CO 4	1		3			1		
CO 5	1	3		3			1	1

#### Mapping of CO with PSO

ICCA7041	PSO1	PSO2	PSO3
CO 1	3	3	3
CO 2	2	3	
CO 3			2
CO 4			
CO 5	3	2	1

#### Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Servlet API and Overview	1,2,3
2	Listeners and Filters	2,3,6
3	Java Server Pages Overview	2,3,6
4	MVC	3,6
5	Tag Library	2,3,6
6	Introduction to Spring Framework	6

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**Department of Computer Science**

Course Code: ICCS7030

Course Name: Advanced Cloud Computing

Prerequisite Course(s): --

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
02	02	-	03	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- Acquire a clear understanding and knowledge of virtualization technology.
- Explore the integration of cloud computing with Big Data and Artificial Intelligence.
- Develop cloud computing applications using Python and MongoDB.

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Cloud Fundamentals</b> Introduction about cloud computing, Cloud deployment models, Cloud service models, Advantages of cloud computing, Limitations or Disadvantages of cloud computing, Seven step model of migration into a cloud.	05	10
2.	<b>Virtualization Technology and Types</b> VirtualBox-Installation and configuration, Containers vs. Virtual Machines, Docker architecture and components , Drawbacks of traditional data centers, Virtualization reference model, Impact of virtualization on resource planning, Principles of working of virtual machine, Server virtualization, Storage virtualization, Desktop virtualization, Application virtualization, Network virtualization, Working with OpenStack, Networking and storage in OpenStack, Core AWS Services-EC2, S3, RDS, and IAM, AWS Lambda and serverless computing	10	20
3.	<b>Cloud Computing with Big Data</b> Introduction to BD, Characteristics of BD, Need for BD, Drivers for BD, BD in cloud computing: Advantages and Challenges, Core architecture of Hadoop.	08	20
4.	<b>Understanding Role of AI in Cloud Computing</b>	07	20

	Introduction to AI, How AI transformed cloud computing, Common applications of AI in cloud management, Benefits and challenges of AI in cloud computing management, AI's impact on IT cloud management.		
5.	<b>Python in Cloud Computing</b> Introduction to python, Features of python for cloud computing, Python role's in cloud computing, Python framework and cloud services, Cloud automation and monitoring using python, Challenges and future trends., Cloud service models: IaaS, PaaS, SaaS, Cloud deployment models: Public, Private, Hybrid, Community	08	20
6.	<b>Cloud Databases</b> SQL vs NoSQL, Advantages of NoSQL, MongoDB commands, CRUD operations in MongoDB, Data aggregation in MongoDB, IUDS for RDBMS Vs. MongoDB, Connection to Python with MongoDB.	07	10
	<b>TOTAL</b>	<b>45</b>	<b>100</b>

**List of Practical:**

Sr. No	Name of Practical	Hours
1.	To study about cloud computing and virtualization technology.	04
2.	To understand working of AWS and security.	02
3.	AWS computer services.	02
4.	AWS storage services.	02
5.	Monitoring and Optimization with AWS.	04
6.	Automation in AWS cloud.	04
7.	Python for Serverless Applications on AWS	02
8.	Introduction to machine learning on AWS	02
9.	Perform MongoDB CRUD operations.	04
10.	Connection of MongoDB and Python.	04
	<b>TOTAL</b>	<b>30</b>

**Text Book (s):**

Title	Author/s	Publication
Cloud Computing Bible	Barrie Sosinsky	John Wiley & Sons

**Reference Book (s):**

Title	Author/s	Publication
Amazon Web Services for Dummies	Bernard Golden	Dummies
Python Essentials for AWS Cloud Developers	Serkan Sakinmaz	Packt Publishing
Cloud Computing With AI	D Shanthi	Scholars Press
Cloud Computing & Big Data: From the Basics to Practical Use Cases	M Sudheep Elayidom, Sarith Divakar M, Lija Mohan, Tanmay Kumar Pandey, Shubham Agrawal	Cengage Learning
An Introduction to Cloud Databases	Vlad Vlasceanu, Wendy A. Neu, Andy Oram, Sam Alapati	O'Reilly Media, Inc.
MongoDB Complete Guide	Manu Sharma	BPB

**Web Material Link(s):**

- <https://www.oracle.com/in/artificial-intelligence/ai-cloud-computing/>
- <https://cloud.google.com/learn/what-is-big-data?hl=en>
- <https://aws.amazon.com/>
- <https://cloud.google.com/python>

**Course Evaluation:****Theory:**

- Continuous Evaluation consists of two tests each of 30 marks and 1 hour of duration and average of the same will be converted out of 30 marks.
- Faculty Evaluation consists of 10 marks as per guidelines provided by Course Coordinator.
- End Semester Examination consists of 60 marks Exam.

**Practical:**

- Continuous Evaluation Consist of Performance of Practical which will be evaluated out of 20 marks for each practical and average of the same will be converted to 20 marks.
- Internal Viva consists of 20 marks.
- Practical performance/quiz/test of 30 marks during End Semester Exam.
- Viva/Oral performance of 30 marks during End Semester Exam.

**Course Outcome(s):**

After the completion of the course, the following course outcomes will be able to:

ICCS7030	Advanced Cloud Computing
CO 1	Gain a solid understanding of the fundamentals of cloud computing and virtualization technology.
CO 2	Explore the application of cloud computing in Big Data (BD) and Artificial Intelligence (AI).
CO 3	Learn to integrate Python with NoSQL databases such as MongoDB.
CO 4	Develop skills in automating and monitoring cloud environments using Python.
CO 5	Understand the key differences between SQL and NoSQL databases.

### Mapping of CO with PO

ICCS7030	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	3	2	1	2	3	2		1
CO 2	3	3	2	2	3	2		1
CO 3	2	2	3	3	3	3		2
CO 4	2	2	3	3	3	3	1	3
CO 5		2	2	3	3	3	2	

### Mapping of CO with PSO

ICCS7030	PSO1	PSO2	PSO3
CO 1	3		1
CO 2	3	2	1
CO 3		2	2
CO 4		2	2
CO 5	1		2

### Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Cloud Fundamentals	1, 2
2	Virtualization Technology and Types	1, 2
3	Cloud Computing with Big Data	1, 2, 3
4	Understanding Role of AI in Cloud Computing	1, 2, 3
5	Python in Cloud Computing	1, 2, 3, 4, 5, 6
6	Cloud Databases	1, 2, 3, 4, 5, 6

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**Department of Computer Application**

Course Code: ICCA7050

Course Name: Relational Data Engineering

Prerequisite Course (s): - -

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- Understand the elementary conception of Database Management Systems.
- give students knowledge of how RDBMS is managed.
- prepare a theoretical as well as practical background of RDBMS.
- understand the concepts compulsory for designing, using and implementing database systems and applications.

**Course Content:**

Module No.	Content	Hours	Weightage in%
1.	<b>Basic concepts of DBMS</b> Basic Concepts: Data, Database, Database systems, Database Management Systems, Need, Applications & Description of Database Approach, DBMS users, Benefits of using DBMS approach, DBMS architecture – Schema, Instance, Types of Models, Concept of Independence, Types, Role & Importance of Database languages, Taxonomy & Categorization of DBMS.	06	15
2.	<b>Entity Relationship Diagram</b> ER diagram – Role & Importance in database design, entity types, entity sets, Types of Attributes, Keys & Entities, Designing & Mapping of Database considering ER diagram, Example of ER Diagram considering applications, Concept of EER diagram. <b>Database Design</b> Concept of Relational Schema, Functional Dependencies, Normalization - definitions of 1NF, 2NF and 3NF, Boyce-Codd Normal Forms (BCNF), Multi-valued Dependency and Fourth Normal Form.	10	20
3.	<b>Basic of SQL</b> Basics concepts of SQL – creation, alteration using DDL,DML,DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All ,	06	15

	view and its types. transaction control commands - Commit, Rollback, Save point case		
4.	<b>Fundamentals of PL/SQL</b> Introduction to PL/SQL - Benefits of PL/SQL, Creating PL/SQL Blocks Defining Variables and Datatype, Using Variables in PL/SQL - Recognizing PL/SQL Lexical Units, Recognizing Data Types, Using Scalar Data Types, Writing PL/SQL Executable Statements, Nested Blocks and Variable Scope, Program Structures to Control Execution Flow - Conditional Control: IF Statements, Conditional Control: CASE Statements, Iterative Control: Basic Loops, Iterative Control: WHILE and FOR Loops, Iterative Control: Nested Loops	06	15
5.	<b>Using &amp; Managing PL/SQL Building Blocks</b> Using Cursors and Parameters, Introduction to Explicit Cursors, Using Explicit Cursor Attributes, Cursor FOR Loops, Cursors with Parameters, Using Cursors for UPDATE, Using Multiple Cursors, Using and Managing Procedures - Creating Procedures, Using Parameters in Procedures, Passing Parameters, Using and Managing Functions - Creating Functions, Using Functions in SQL Statements.	06	15
6.	<b>Database Triggers &amp; Exception Handling</b> Using and Managing Triggers - Introduction To Triggers, Creating DML Triggers, Creating DML Triggers, Creating DDL and Database Event Triggers, Managing Triggers, Exception Handling - Handling Exceptions, Trapping Oracle Server Exceptions, Trapping User-Defined Exceptions, Recognizing the Scope of Exceptions.	05	10
7.	<b>Transaction Processing and Database backup and Recovery</b> Transaction concepts: Transaction execution and Problems, Transaction execution and control with SQL, Transaction properties, Transaction log, Concurrency control , Locking methods for concurrency control, Timestamp methods for concurrency control, Optimistic methods for concurrency control ( Read phase, validation phase, Write phase), Deadlock handling - detection and resolution, Database backup and Recovery - Need of Database backup, Database backup techniques, Types of Database failures, Types of Database recovery (Forward recovery, backward recovery and Media recovery), Recovery techniques (Deferred Update, Immediate update, Shadow Paging, Checkpoints), Buffer management.	06	10
	<b>TOTAL</b>	45	100

**List of Practical(s):**

Sr. No	Name of Practical	Hours
1.	Implement DDL Commands (Create, Alter, drop) Table: The Create Table Command, creating a table from a table (with data, without data, with all columns, with selected columns), Drop Table, Alter Table, Renaming Tables	02
2.	Implement DML Commands (Select, insert, update, delete)	02
3.	Implement Constraints: Defining integrity constraints using create table and the alter table command.	02
4.	Implement View, Index, Sequences, rowed, row num, Default Value Concept	02
5.	Implement Join (Inner Join, Equi Joins, Self-Join, Outer Joins)	02
6.	Implement subquery concepts	02
7.	Implement various set Operators	02

8.	Implement various single row functions: String functions, Numeric Functions, Date Functions, Date Conversion Functions	02
9.	Implement aggregate / group functions, having clause and Sorting Data, Handling Null values (IS NULL), Like Clause	02
10.	Implement Basic concepts of PL/SQL	02
11.	Implement Procedure, function, package	04
12.	Implement Triggers and Exception Handling	04
13.	Implement Transaction processing and control mechanism	02
<b>TOTAL</b>		<b>30</b>

#### Text Book(s):

Title	Author/s	Publication
Fundamentals of Database Systems	Ramez Elmsari, Shamkant B Navathe	Pearson Education
SQL, PL/SQL the Programming Language of Oracle	Ivan Bayross	BPB Publications
Database System Concept	Silberschatz, Korth, Sudarshan	McGraw Hill

#### Reference Book(s):

Title	Author/s	Publication
Database Management Systems	Ramakrishnan, Gehrke	McGraw Hill
An Introduction to Database Systems	C J Date, A Kannan, S Swaminathan	Pearson Education
PHP and MySQL 24-Hour Trainer	Andrea Tarr	Wiley

#### Web Material Link:

- <https://docs.oracle.com/en/database/index.html>
- <https://docs.oracle.com/database/121/SQLRF/toc.htm>

#### Course Evaluation:

##### Theory

- Continuous Evaluation consists of two tests of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination consists of 60 marks.

##### Practical

- Continuous Evaluation consists of the performance of practical, which will be evaluated out of 10 marks per each practical and average of the entire practical will be converted to 20marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/test consists of 30 marks during End Semester Examination. Viva/Oral performance consists of 30 marks during End Semester Examination.

**Course Outcome(s):**

ICCA7050	RELATIONAL DATA ENGINEERING
CO1	Understand different database models and query languages to manage the data for given real.
CO2	Design optimized relational database schemas by applying Entity-Relationship (ER) modeling and normalization techniques (up to BCNF and 4NF) to eliminate data anomalies.
CO3	Construct and execute comprehensive SQL queries for data definition (DDL), manipulation (DML), and control (DCL), including the use of joins, sub-queries, and views.
CO4	Develop robust PL/SQL programs utilizing control structures, cursors, procedures, functions, and triggers to implement backend business logic and handle database exceptions.
CO 5	Analyze database transaction processing mechanisms, evaluating concurrency control protocols and backup/recovery techniques to ensure data integrity and reliability.

**Mapping of CO with PO**

ICCA7050	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	3	2	1	1	2			
CO 2	3	3	2	1	2			
CO 3	2	3	3	2	2	1		
CO 4	2	2	3	2	2	2	1	1
CO 5	2	2	3	2	3	2	1	2

**Mapping of CO with PSO**

ICCA7050	PSO1	PSO2	PSO3
CO 1	2		
CO 2	3	2	
CO 3	3	2	
CO 4	3	2	
CO 5	3	2	

**Level of Bloom's Revised Bloom's Taxonomy in Assessment**

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Basic concepts of DBMS	1, 2
2	Entity Relationship Diagram	2, 4
3	Basic of SQL	3, 4, 6
4	Fundamentals of PL/SQL	2, 5
5	Using & Managing PL/SQL Building Blocks	2, 3, 6
6	Database Triggers & Exception Handling	2, 3, 5
7	Transaction Processing and Database backup and Recovery	2, 4

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**Department of Computer Science**

Course Code: ICCS7040

Course Name: Software Quality & Assurance

Prerequisite Course(s): --

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	01	04	40	60	-	-	100	00	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- Understand the core concepts and processes of software quality and assurance practices applied in software development.
- Describe and conceptualize the models and methodologies of software quality management, including the software development life cycle (SDLC) and agile practices.
- Familiarize with the frameworks and tools used in quality assurance and project management.

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Introduction:</b> SDLC life cycle. Basic concept of Software Quality Assurance. Software Testing as a quality assurance technique. Testing and quality assurance in various types of software (Web application, Desktop Application and Mobile Application). Factors affecting Software Quality. Review techniques.	10	25
2.	<b>Software Quality Control:</b> Bug life cycle and Tracking system. Quality Assurance and Quality Control. SQA plan. Quality Control Process.	4	10
3.	<b>Tracking the Software Quality using Diagrams:</b> Pareto Diagram, Cause Effect Diagram, Scatter Diagram, Run chart.	8	15
4.	<b>Software Quality Management:</b> Quality improvement process. Statistical Quality Assurance. Software Reliability. Informal Review.	6	12
5.	<b>Quality Cost:</b> Quality Cost Measurement, role of Quality cost in decision making. Software Configuration management (Version control and Built Management). CMM model. CMMI	10	25

6.	<b>Quality Assurance Standards:</b> Software Metrics and Measurement, Agile Model, ISO 9001 Quality Standard. Six Sigma. DevOps Practices for Quality Improvement	7	13
	<b>TOTAL</b>	<b>45</b>	<b>100</b>

#### List of Tutorial:

Sr. No	Name of Tutorial	Hours
1.	Software Quality Attributes (Usability, Reliability, Maintainability, etc.)	1
2.	Software Quality Models (ISO/IEC 25010, McCall's Quality Model, etc.)	1
3.	Software Quality Management	1
4.	Types of Testing (Unit Testing, Integration Testing, System Testing, Acceptance Testing)	1
5.	Test Planning and Management	1
6.	Test Case Design and Execution	1
7.	Test Automation	1
8.	Software Metrics (Product Metrics, Process Metrics, Project Metrics)	1
9.	Software Process Improvement	1
10.	Software Quality Tools	1
11.	Software Quality Standards	1
12.	Real-world Examples of Software Quality Management	1
13.	Ethics and Professionalism in Software Quality	1
14.	AI and Machine Learning in Quality Assurance	1
15.	Continuous Testing and Continuous Quality Improvement	1
	<b>TOTAL</b>	<b>15</b>

#### Text Book (s):

Title	Author/s	Publication
Software Quality Assurance From Theory to Implementation	Daniel Galin	Pearson Addison Wesley

#### Reference Book (s):

Title	Author/s	Publication
Software Quality Assurance	Claude Y. Laporte, Alain April	IEEE Press, IEEE Computer Society, Wiley

#### Web Material Link(s):

- <https://onlinecourses.nptel.ac.in/>
- <https://onlinecourses.swayam2.ac.in/>
- <https://nptel.ac.in/courses/>

**Course Evaluation:****Theory:**

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

**Tutorial:**

- Continuous Evaluation consists of performance of tutorial which will be evaluated out of 10 marks for each practical and average of the same will be converted to 50 marks.
- Viva/ Oral performance consists of 50 marks.

**Course Outcome(s):**

After the completion of the course, the following course outcomes will be able to:

ICCS7040	Software Quality & Assurance
CO 1	Comprehend the Software Development Life Cycle (SDLC) and the fundamental concepts of Software Quality Assurance (SQA).
CO 2	Identify and apply various software testing techniques and quality assurance practices across different types of software.
CO 3	Analyze and implement quality control processes, including bug tracking, SQA plans, and various quality control techniques.
CO 4	Utilize different quality management diagrams to track and improve software quality.
CO 5	Understand and apply software quality management standards and models for continuous quality improvement and cost-effective decision-making.

**Mapping of CO with PO**

ICCS7040	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	2	2	3	1	1		2	1
CO 2	2	2	3	2	1		1	1
CO 3	2	3	3	2	1		1	1
CO 4	2	3	3	2	2	1	2	2
CO 5	2	3	3	2	2	1	3	3

**Mapping of CO with PSO**

ICCS7040	PSO1	PSO2	PSO3
CO 1	2		
CO 2	3	2	
CO 3	3	2	
CO 4	3	2	
CO 5	3	2	2

**Level of Bloom's Revised Bloom's Taxonomy in Assessment**

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

<b>Module No</b>	<b>Content</b>	<b>RBT Level</b>
<b>1</b>	Introduction	1,2,3
<b>2</b>	Software Quality Control	2,3,5,6
<b>3</b>	Tracking the Software Quality using Diagrams	1,2,3,6
<b>4</b>	Software Quality Management	2,3,6
<b>5</b>	Quality Cost	2,3,6
<b>6</b>	Quality Assurance Standards	6

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**Department of Computer Science**

Course Code: ICCS7910

Course Name: Project - I

Prerequisite Course(s): --

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
-	10	-	10	-	-	80	120	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- identify, analyze, and articulate projects with a comprehensive and systematic approach.
- develop creative thinking.
- perform in a team.

**Course Content:**

Module No.	Content
1.	<b>Selection of Title</b> Select a topic of interest to work upon which can be from any domain. After selecting the topic and proposing the title, get approval from the concerned faculty
2.	<b>Literature Review</b> Study in detail about the topic chosen.
3.	<b>Project Proposal</b> Prepare the proposal on the aspect of the selected area to work upon.
4.	<b>Implementation</b> Implementation of the proposal in any of the programming languages
5.	<b>Report Writing</b> The report must be prepared as per suggested guidelines consisting of Software Engineering, Preamble, Objectives, Scope, Introduction, Conclusions, Recommendations and Annexure.
6.	<b>Presentation &amp; Question-Answer</b> At the end of the semester, the student/group of students shall give a presentation of their work followed by a viva-voce examination.

**Course Evaluation:**

Sr. No	Evaluation Criteria	Marks
1.	Selection of the topic (Within first 20 Days of commencement of semester)	20
2.	Initial Presentation of the topic	20
3.	An actual work carried out.	20
4.	Report writing as per guidelines.	20
5.	Project and report submission	20
6.	Presentation & Question-Answer session.	100
<b>GRAND TOTAL</b>		<b>200</b>

**Course Outcome(s):**

After the completion of the course, the following course outcomes will be able to:

ICCS7910	PROJECT-I
CO 1	Identify and analyze real-world problems to formulate a project title and scope with a focus on social and environmental benefits.
CO 2	Conduct a systematic literature review and study of existing systems to propose innovative computing solutions.
CO 3	Design a technical solution by applying software engineering principles, algorithms, and computational methods.
CO 4	Implement the proposed system/application using modern programming tools, frameworks, and interdisciplinary approaches.
CO 5	Prepare comprehensive technical reports and deliver professional presentations to demonstrate the project to diverse stakeholders.

**Mapping of CO with PO**

ICCS7910	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	2	3	1	2	2	2	1	2
CO 2	2	2	1	3	2	2	1	3
CO 3	3	3	3	2	1	2	1	1
CO 4	2	2	3	2	3	3	1	2
CO 5	1	1	1	1		1	3	3

**Mapping of CO with PSO**

ICCS7910	PSO1	PSO2	PSO3
CO 1	1	3	2
CO 2	1	2	3
CO 3	2	3	2
CO 4	2	3	3
CO 5	3	1	3

**Level of Bloom's Revised Bloom's Taxonomy in Assessment**

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

<b>Module No</b>	<b>Content</b>	<b>RBT Level</b>
1	Selection of Title	2
2	Literature Review	4
3	Project Proposal	2,3
4	Implementation	5,6
5	Report Writing	4,6
6	Presentation & Question-Answer	4,5



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# SECOND YEAR M.SC.(CS)

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P P SAVANI UNIVERSITY															
SCHOOL OF ENGINEERING															
INSTITUTE OF COMPUTER SCIENCE & APPLICATION															
TEACHING & EXAMINATION SCHEME FOR M. Sc. (COMPUTER SCIENCE) PROGRAMME AY: 2025-26															
Sem	Course Code	Course Title	Offered By	Teaching Scheme					Examination Scheme						
				Contact Hours				Credit	Theory		Practical		Tutorial		Total
				Theory	Practical	Tutorial	Total		CE	ESE	CE	ESE	CE	ESE	
3	ICCS8010	Machine Learning	CS	03	04	-	07	05	40	60	40	60	-	-	200
	ICCS8020	Artificial Intelligence	CS	03	02	-	05	04	40	60	40	60	-	-	200
	ICCS8030	Online Course-I	CS	03	-	-	03	03	40	60	-	-	-	-	100
	ICCS8910	Project-II	CS	-	10	-	10	10	-	-	80	120	-	-	200
		Elective-I	CS/CA	02	02	-	04	03	40	60	40	60	-	-	200
		Life Skill Elective Course-I	CLSC	02	-	-	02	02	100	-	-	-	-	-	100
						<b>Total</b>	<b>28</b>	<b>22</b>						<b>1000</b>	
4	ICCS8060	Online Course-II	CS	03	0	-	03	03	40	60	-	-	-	-	100
	ICCS8920	Dissertation/Major Project	CS	-	20	-	20	20	-	-	200	300	-	-	500
						<b>Total</b>	<b>23</b>	<b>23</b>						<b>600</b>	

P P SAVANI UNIVERSITY															
SCHOOL OF ENGINEERING															
INSTITUTE OF COMPUTER SCIENCE & APPLICATION															
TEACHING & EXAMINATION SCHEME FOR M. Sc. (COMPUTER SCIENCE) PROGRAMME AY: 2025-26															
Sem	Course Code	Course Title	Offered By	Teaching Scheme					Examination Scheme						
				Contact Hours				Credit	Theory		Practical		Tutorial		Total
		Department Elective Courses		Theory	Practical	Tutorial	Total		CE	ESE	CE	ESE	CE	ESE	
3	ICCS8510	Data Science	CS	02	02	-	04	03	40	60	40	60	-	-	200
	ICCS8520	Data Structure & Algorithms	CS	02	02	-	04	03	40	60	40	60	-	-	200
		Life Skill Elective Course-I													
3	CLSC2040	Life Skill Lessons from Bhagavad Gita	CLSC	02	-	-	02	02	100	-	-	-	-	-	100
3	CLSC2050	Learnings from Ramayana	CLSC	02	-	-	02	02	100	-	-	-	-	-	100
3	CLSC2060	Indian Heritage & Culture	CLSC	02	-	-	02	02	100	-	-	-	-	-	100
3	CLSC2070	Indian Classical Music	CLSC	01	02	-	03	02	50	-	50	-	-	-	100
3	CLSC2080	Indian Classical Dance	CLSC	01	02	-	03	02	50	-	50	-	-	-	100
3	CLSC2090	Constitutional Empowerment	CLSC/SLM	02	-	-	02	02	100	-	-	-	-	-	100
3	CLSC2100	Indian Agriculture	CLSC/SOAg	01	02	-	03	02	50	-	50	-	-	-	100
3	CLSC2110	Indian Health Science	CLSC/SOAvr	02	-	-	02	02	100	-	-	-	-	-	100
3	CLSC2120	Indian Architecture and Town Planning	CLSC/SOA	02	-	-	02	02	100	-	-	-	-	-	100
3		MOOC Course	Resp. School	03	-	-	03	03	100	-	-	-	-	-	100

**P P Savani University**  
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**Institute of Computer Science and Application**

**Department of Computer Science**

Course Code: ICCS8010

Course Name: Machine Learning

Prerequisite Course(s): --

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	04	-	05	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

Understand interdisciplinary applications of machine learning across various domains. Implement machine learning algorithms using relevant programming languages and libraries.

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Getting Started with Machine Learning</b> Overview of Machine Learning: Definitions, Types, and Applications. Fundamentals of Python Programming for Machine Learning. Data Preprocessing: Handling Missing Data, Feature Scaling, and Data Transformation Techniques. Exploratory Data Analysis (EDA) and Data Visualization Techniques. Introduction to Scikit-learn Library for Implementing Machine Learning Algorithms. Trending Topic: Ethical AI and Responsible Machine Learning.	7	15%
2.	<b>Supervised Learning Techniques</b> Linear Regression: Simple and Multiple Regression, Evaluation Metrics. Logistic Regression: Binary and Multiclass Classification, Evaluation Metrics. Decision Trees and Random Forests: Concepts, Decision Tree Construction, Ensemble Methods Support Vector Machines (SVM): Linear and Non-linear SVM, Kernel Methods. Naive Bayes Classifier: Bayes' Theorem, Gaussian Naive Bayes, Multinomial Naive Bayes. Explainable AI (XAI) in Supervised Learning	8	20%
3.	<b>Unsupervised Learning</b> K-Means Clustering: Algorithm, Choosing the Number of Clusters, Evaluation. Hierarchical Clustering: Agglomerative and Divisive Methods. Principal Component Analysis (PCA): Dimensionality Reduction, Eigenvectors, Eigenvalues. Association Rule Learning: Apriori Algorithm, Market Basket Analysis. Anomaly Detection: Techniques for Detecting Outliers in Data.	6	15%
4.	<b>Introduction to Neural Networks</b> Self-Supervised Learning Techniques. Introduction to Artificial Neural Networks (ANNs): Perceptrons, Activation Functions.	5	10%
5.	<b>Multi-layer Perceptrons and Backpropagation</b> Architecture of Multi-layer Perceptrons (MLPs), Backpropagation Algorithm.	5	10%
6.	<b>Advanced Neural Network Architectures</b>	7	15%

	Convolutional Neural Networks (CNNs) including architecture, convolutional layers, and pooling layers; Recurrent Neural Networks (RNNs) and LSTM networks.		
7.	<b>Model Evaluation and Optimization</b> Performance Evaluation Techniques, Hyperparameter Tuning Strategies, Model Evaluation Metrics, Bias-Variance Trade-off.	5	10%
8.	<b>Cutting-Edge Topics in Machine Learning</b> Feature Selection and Dimensionality Reduction, Automated Machine Learning (AutoML), Reinforcement Learning, Time Series Analysis, Generative Adversarial Networks (GANs), Transfer Learning and Model Deployment.	2	5%
	<b>Total</b>	<b>45</b>	<b>100</b>

#### List of Practical:

Sr. No	Name of Practical	Hours
1.	Given a dataset with missing values and categorical variables, write a Python script to handle missing data and perform feature scaling. Include comments to explain each step.	06
2.	Use a dataset of house prices to implement a simple linear regression model. Evaluate the model using Mean Absolute Error (MAE) and R-squared metrics. Provide visualizations of the results.	10
3.	Implement a logistic regression model to classify whether an email is spam or not using a given dataset. Report the accuracy, precision, and recall of your model. Include confusion matrix visualizations.	09
4.	Build a decision tree model on a dataset of customer information to predict whether a customer will churn. Visualize the decision tree and interpret the results.	06
5.	Implement a support vector machine for classifying handwritten digits using the MNIST dataset. Compare the performance of linear and non-linear SVMs.	06
6.	Apply the K-means clustering algorithm to a dataset of customer purchases. Determine the optimal number of clusters using the Elbow method and visualize the clusters.	06
7.	Conduct PCA on a high-dimensional dataset (e.g., the Iris dataset) to reduce its dimensions. Visualize the results in a 2D plot and explain the variance captured by the principal components.	03
8.	Create a simple neural network using TensorFlow or PyTorch to classify images from the CIFAR-10 dataset. Report the training and validation accuracy.	03
9.	Implement a CNN for image classification on a dataset of your choice (e.g., CIFAR-10 or Fashion MNIST). Compare the performance of your CNN with a traditional neural network.	05
10.	Choose any machine learning model (e.g., Random Forest, SVM) and perform hyperparameter tuning using Grid Search or Random Search. Present the results before and after tuning, including model performance metrics.	06
	<b>TOTAL</b>	<b>60</b>

**Text Book (s):**

Title	Author/s	Publication
Introduction to Machine Learning with Python: A Guide for Data Scientists	Andreas C. Müller and Sarah Guido	O'Reilly Media

**Reference Book (s):**

Title	Author/s	Publication
Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems	Aurélien Géron	O'Reilly Media
Interpretable Machine Learning: A Guide for Making Black Box Models Explainable	Christoph Molnar	Leanpub
Ethics of Artificial Intelligence and Robotics	Vincent C. Müller and Nick Bostrom	Cambridge University Press

**Web Material Link(s):**

- [https://onlinecourses.nptel.ac.in/noc25\\_cs50/preview](https://onlinecourses.nptel.ac.in/noc25_cs50/preview)
- <https://www.coursera.org/learn/machine-learning-with-python>
- <https://www.coursera.org/specializations/machine-learning-introduction>

**Course Evaluation:****Theory:**

- Continuous Evaluation consists of two tests each of 30 marks and 1 hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

**Practical:**

- Continuous Evaluation consists of the performance of practical, which will be evaluated out of 10 per each practical. At the end of the semester, the average of the entire practical will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/test consists of 30 marks.
- External viva consists of 30 marks.

**Course Outcome(s):**

After the completion of the course, the following course outcomes will be able to:

ICCS8010	Machine Learning
CO 1	Define and categorize different types of machine learning and apply fundamental Python programming concepts essential for machine learning.
CO 2	Demonstrate proficiency in data preprocessing techniques, conduct data visualization techniques to extract insights from datasets.
CO 3	Implement and evaluate various supervised learning algorithms, including linear regression, logistic regression, decision trees, and support vector machines, using appropriate evaluation metrics.
CO 4	Apply unsupervised learning methods such as K-means clustering, hierarchical clustering, and principal component analysis (PCA) to analyze and interpret complex datasets.
CO 5	Understand and implement ANNs, including multi-layer perceptrons (MLPs), CNNs and RNNs for practical machine learning applications.

### Mapping of CO with PO

ICCS8010	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	2	2	1		1			1
CO 2	2	3	2	2	2			1
CO 3	3	3	3	3	3			1
CO 4	3	3	3	3	3			1
CO 5	3	3	3	3	3	1		2

### Mapping of CO with PSO

ICCS8010	PSO1	PSO2	PSO3
CO 1	2	1	
CO 2	3	2	
CO 3	3	3	2
CO 4	3	3	2
CO 5	3	3	3

### Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Getting Started with Machine Learning	1,2,3
2	Supervised Learning Techniques	3,4
3	Unsupervised Learning	3,4
4	Introduction to Neural Networks	2,3
5	Multi-layer Perceptrons and Backpropagation	3,4
6	Advanced Neural Network Architectures	4,5
7	Model Evaluation and Optimization	4,5
8	Cutting-Edge Topics in Machine Learning	5,6

**P P Savani University**  
**School of Engineering**  
**Institute of Computer Science and Application**

**Department of Computer Science**

Course Code: ICCS8020

Course Name: Artificial Intelligence

Prerequisite Course(s): --

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	-	04	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

Provide foundational knowledge and practical skills to design, implement, and evaluate AI techniques for solving real-world problems while understanding their ethical and societal implications

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Introduction to Artificial Intelligence</b> Definition and Scope of AI, History and Evolution, Applications and Importance, Ethics and Societal Impact of AI	5	10%
2.	<b>Problem Solving and Search Algorithms</b> Problem-Solving Agents, Uninformed Search: Breadth-First Search, Depth-First Search, Informed Search: A* Search, Heuristic Search, Introduction to Heuristics	7	15%
3.	<b>Knowledge Representation and Reasoning</b> Knowledge Representation: Propositional & First-Order Logic, Semantic Networks, Frames. Inference Techniques: Forward Chaining, Backward Chaining, Resolution Ontologies and Semantic Web.	6	15%
4.	<b>Uncertainty Handling in AI</b> Bayesian Networks, Fuzzy Logic. Basics of Probabilistic Reasoning	5	10%
5.	<b>Connectionist Models and Neural Networks</b> Introduction to Neural Networks. Feedforward Neural Networks, Deep Learning: Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Limitations of RNNs/LSTMs. Generative Adversarial Networks (GANs).	5	10%
6.	<b>Natural Language Processing (NLP)</b> Basics of NLP: Syntax, Semantics, Pragmatics. Text Processing Techniques: Tokenization, Stemming, Lemmatization. Language Modelling: N-grams, Hidden Markov Models. NLP Applications: Sentiment Analysis, Named Entity Recognition.	6	15%
7.	<b>Transformers</b> Motivation for Transformers, Overview of Transformer architecture, Self-Attention Mechanism, Inside the Transformer Block, Applications of Transformers, Initializing Transformer models using PyTorch/TensorFlow	6	15%
8.	<b>Advanced Topics and Societal Implications</b>	5	10%

	Applications in Healthcare, Finance, Robotics, etc. Importance of AI in Industry. Ethical Considerations: Bias, Fairness, Explainability, Trust.		
	<b>Total</b>	<b>45</b>	<b>100</b>

#### List of Practical:

Sr. No	Name of Practical	Hours
1.	Research and present a case study showing the societal impact of an existing AI system (e.g., facial recognition, healthcare AI).	02
2.	Implement Breadth-First Search and Depth-First Search algorithms to solve a maze problem in Python.	02
3.	Design and simulate A* Search to find the shortest path between nodes in a graph using heuristics.	02
4.	Create a knowledge base using Propositional or First-Order Logic for a simple expert system (e.g., medical diagnosis).	04
5.	Demonstrate Forward Chaining and Backward Chaining inference using a set of logical rules on a real-world dataset.	04
6.	Build and visualize a Bayesian Network to represent probabilistic relationships (e.g., disease symptoms, weather prediction).	06
7.	Design Transformer based Model to resolve classification & regression based problems	04
8.	Process a collection of text documents: perform tokenization, stemming, and lemmatization and report findings.	02
9.	Implement a simple feedforward neural network using libraries like TensorFlow or PyTorch and Train the neural network on a dataset (e.g., MNIST digits classification) and evaluate its accuracy.	02
10.	Implement a Convolutional Neural Network (CNN) for image classification tasks and Experiment with different architectures and hyperparameters to improve model performance.	02
	<b>TOTAL</b>	<b>30</b>

#### Text Book (s):

Title	Author/s	Publication
Artificial Intelligence	Elaine Rich And Kevin Knight	Tata McGraw-Hill

#### Reference Book (s):

Title	Author/s	Publication
Artificial Intelligence: Foundations of Computational Agents	David L. Poole and Alan K. Mackworth	Cambridge University Press
Artificial Intelligence: A Modern Approach	Stuart Russell and Peter Norvig	Pearson

#### Web Material Link(s):

- [https://onlinecourses.nptel.ac.in/noc25\\_cs159/preview](https://onlinecourses.nptel.ac.in/noc25_cs159/preview)
- <https://nptel.ac.in/courses/106102220>
- <https://nptel.ac.in/courses/106105077>

## Course Evaluation:

### Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

### Practical:

- Continuous Evaluation consists of the performance of practical, which will be evaluated out of 10 per each practical. At the end of the semester, the average of the entire practical will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/test consists of 30 marks.
- External viva consists of 30 marks.

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## Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

ICCS8020	Artificial Intelligence
CO 1	Understand and apply foundational concepts, scope, and societal impacts of Artificial Intelligence.
CO 2	Analyze, select, and implement various AI problem-solving and search algorithms for complex computational tasks.
CO 3	Demonstrate knowledge representation and reasoning techniques including logical inference, semantic networks, and handling uncertainty with Bayesian and fuzzy models.
CO 4	Build and evaluate intelligent models using transformers, neural networks, and deep learning approaches for real-world applications.
CO 5	Apply natural language processing and ethical frameworks to design responsible AI solutions with effective communication and teamwork.

## Mapping of CO with PO

ICCS8020	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	2	2	1		1		2	1
CO 2	3	3	2	2	2	1		1
CO 3	3	3	2	3	2	1		1
CO 4	3	3	3	3	3	2		2
CO 5	2	2	2	2	2	1	3	2

## Mapping of CO with PSO

ICCS8020	PSO1	PSO2	PSO3
CO 1	3		2
CO 2		3	
CO 3	2	3	1
CO 4		3	
CO 5	2		3

## Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

<b>Module No</b>	<b>Content</b>	<b>RBT Level</b>
1	Introduction to Artificial Intelligence	1,2
2	Problem Solving and Search Algorithms	2,3,4
3	Knowledge Representation and Reasoning	2,3,4
4	Uncertainty Handling in AI	3,4,5
5	Transformers	2,4,5
6	Natural Language Processing (NLP)	2,3,4
7	Connectionist Models and Neural Networks	2,3,6
8	Advanced Topics and Societal Implications	5,6

**P P Savani University**  
**School of Engineering**  
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**Department of Computer Science**

Course Code: ICCS8030  
 Course Name: Online Course-I  
 Prerequisite Course(s): --

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	-	03	100	0	-	-	-	-	100

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help the learners to

- Learn new subjects as per recent trends in the industry from national experts.

**Course Content:**

Performance analysis will be based on any one of the following subjects:

1. Deep Learning
2. Computer Graphics
3. R Programming
4. Artificial Intelligence
5. Machine Learning
6. Virtual Reality
7. Theory of computation
8. Data Structures and Algorithm
9. Advanced Distributed Systems
10. Software Project management
11. Ethical Hacking
12. UI & UX
13. Data Analytics
14. Introduction to Embedded System Design
15. Algorithmic Game Theory

Or any other NPTEL course; available time to time.

**Course Evaluation:**

**Practical**

- Continuous Evaluation as per the guidelines of NPTEL assignments and tests.
- The NPTEL score will be directly fetched and converted out of 100.

**Course Outcome(s):**

After completion of the course, the student will be able to

<b>ICCS8030</b>	<b>Online Course-I</b>
C01	Inculcate mode of self-learning.
C02	Exposure to relevant and newest tools and technologies.
C03	Value addition when the student is applying for jobs.
C04	Use NPTEL program for GATE and high studies preparation.
C05	Facilitate students to attain certificate and to make them employable in the industry or pursue higher education program.

**Mapping of CO with PO**

<b>ICCS8030</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>
C01								3
C02	1	1	1		2	2		2
C03	1	2	2		1	1	2	2
C04	1	1		2				3
C05	1	2	2	1	1	1	2	3

**Mapping of CO with PSO**

<b>ICCS8030</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
C01			3
C02	2	2	2
C03	2	1	3
C04	1		3
C05	2	1	3

**P P Savani University**  
**School of Engineering**  
**Institute of Computer Science and Application**

**Department of Computer Science**

Course Code: ICCS8910

Course Name: Project-II

Prerequisite Course(s): --

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
-	10	-	10	-	-	80	120	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help learners to

- Identify, analyze, and articulate projects with a comprehensive and systematic approach.
- Develop creative thinking.
- Perform in a team

**Course Content:**

Module No.	Content
1.	<b>Topic Selection and Title Proposal</b> Identifying areas of interest across various domains. Proposing a title and obtaining faculty approval. Importance of topic relevance and scope.
2.	<b>Literature Review</b> Conducting a thorough literature review on the selected topic. Identifying key research papers, articles, and case studies. Summarizing findings and establishing a theoretical framework.
3.	<b>Project Proposal Development</b> Structuring the project proposal. Defining objectives, methodology, and expected outcomes. Preparing a timeline and resource allocation.
4.	<b>Implementation of the Proposal</b> Selecting appropriate programming languages and tools for implementation. Developing the project according to the proposal. Testing and debugging processes.
5.	<b>Report Writing</b> Preparing the final report following specified guidelines. Sections to include: Software Engineering principles, Preamble, Objectives, Scope, Introduction, Conclusions, Recommendations, and Annexure. Emphasis on clarity, coherence, and academic integrity.
6.	<b>Presentation Skills</b> Techniques for effective presentation. Creating visual aids and slide decks. Engaging the audience and handling questions.

7.	<b>Viva-Voce Preparation</b> Preparing for the viva-voce examination. Anticipating questions and formulating responses. Importance of confidence and clarity in communication.
8.	<b>Final Presentation and Evaluation</b> Delivering the final presentation of the project. Engaging in a Q&A session with faculty and peers. Receiving feedback and evaluation based on performance.

#### Course Evaluation:

Sr. No	Evaluation Criteria	Marks
1.	Topic Selection and Title Proposal	20
2.	Literature Review	20
3.	Project Proposal Development	20
4.	Implementation of the Proposal	30
5.	Report Writing	20
6.	Presentation Skills	20
7.	Viva-Voce Preparation	20
8.	Final Presentation and Evaluation	50
	<b>TOTAL</b>	<b>200</b>

#### Course Outcome(s):

After the completion of the course, the following course outcomes will be able to:

ICCS8910	Project-II
CO 1	Identify and propose a relevant project title, demonstrating understanding of topic relevance and scope.
CO 2	Conduct a thorough literature review to summarize key research and establish a theoretical framework.
CO 3	Structure a project proposal that defines objectives, methodology, and expected outcomes.
CO 4	Develop the project using appropriate tools and languages, applying effective testing and debugging processes.
CO 5	Prepare and deliver a final report and presentation, engaging effectively with the audience and demonstrating clear communication.

#### Mapping of CO with PO

ICCS8910	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	2	3	2	2	1	1	2	2
CO 2	2	3	2	3	1	1	2	2
CO 3	2	3	3	3	1	1	2	2
CO 4	3	3	3	2	2	2	2	2
CO 5	2	2	2	2	1	1	3	3

### Mapping of CO with PSO

ICCS8910	PSO1	PSO2	PSO3
CO 1	3	2	2
CO 2	3	2	3
CO 3	3	2	3
CO 4	3	2	3
CO 5	3	2	3

### Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Topic Selection and Title Proposal	1,2
2	Literature Review	2,3
3	Project Proposal Development	2,3,4
4	Implementation of the Proposal	3,4
5	Report Writing	2,3,4,5
6	Presentation Skills	3,4,5
7	Viva-Voce Preparation	2,3,5
8	Final Presentation and Evaluation	3,4,5,6

**P P Savani University**  
**School of Engineering**  
**Institute of Computer Science and Application**

**Department of Computer Science**

Course Code: ICCS8510

Course Name: Data Science

Prerequisite Course(s): --

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
02	02	-	03	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To develop the ability to analyze data critically, apply quantitative techniques, and derive meaningful insights for informed decision-making.

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Introduction to Data Science, Data Collection and Preparation Techniques</b> Data Science, significance & applications, Tools and technologies used in Data Science. Basics of data types and data structures. Data acquisition techniques: APIs, web scraping, Data cleaning methods: handling missing values, outliers. Data transformation and normalization. Data storage formats and database basics	4	15
2.	<b>Exploratory Analytics and Visualization Methods</b> Descriptive statistics: mean, median, variance, correlation. Data visualization principles and techniques. Univariate and multivariate analysis. Visualization tools/libraries: Matplotlib, Seaborn, Plotly. Feature Selection & Removal Mechanism.	4	16
3.	<b>Core Principles of Machine Learning</b> Introduction to machine learning types: supervised, unsupervised, reinforcement. Supervised learning: regression, classification techniques. Unsupervised learning: clustering, dimensionality reduction. Model evaluation and selection, cross-validation. Algorithm optimization and hyperparameter.	7	17
4.	<b>Advanced Techniques in Machine Learning, Data Presentation and Interactive Visualization</b> Ensemble learning: random forest, gradient boosting. Neural networks and deep learning basics. Hyperparameter tuning, feature engineering. Principles of visualization. Interactive visualization and dashboard creation	6	17

5.	<b>Ethics, Privacy, and Social Impact of Data Science</b> Ethics and privacy issues. Impact of data science on society and industries.	3	17
6.	<b>Practical Applications: Capstone Project and Integration</b> Real-world problem formulation. Data acquisition, wrangling, analysis. Application of ML models. Visualization and presentation.	6	18
	<b>Total</b>	<b>30</b>	<b>100</b>

**List of Practical:**

Sr. No	Name of Practical	Hours
1.	Load a real-world dataset using Python and identify the data types and structures present in the dataset. Summarize the dataset with basic statistics.	02
2.	Use an API (e.g., Twitter or weather API) to collect data, then clean the dataset by handling missing values, removing duplicates, and detecting outliers.	02
3.	Perform data transformation and normalization on a dataset with varying scales. Compare before and after normalization statistics.	04
4.	Explore a given dataset using descriptive statistics (mean, median, variance) and visualize univariate distributions using Matplotlib or Seaborn.	04
5.	Conduct a correlation analysis between multiple variables in a dataset, and visualize the relationships using heatmaps or scatter plots.	04
6.	Transform categorical variables using techniques like one-hot encoding or label encoding and Engineer new features from existing data to improve machine learning model performance.	04
7.	Implement supervised learning algorithms such as linear regression or decision trees using Scikit-learn and Train the models on prepared datasets and evaluate their performance using appropriate metrics.	04
8.	Use cross-validation techniques to assess the generalization performance of machine learning models and compare and select the best-performing model based on evaluation metrics like accuracy or mean squared error.	02
9.	Create interactive dashboards using tools like Tableau or Power BI or Google Data Studio or Looker lit to visualize insights from datasets and Incorporate widgets and filters to allow users to interactively explore data.	02
10.	Work on a data science project from start to finish, including data acquisition, preprocessing, analysis, modeling, and visualization and Present findings and insights from the project in a clear and visually appealing manner.	02
	<b>TOTAL</b>	<b>30</b>

**Text Book (s):**

Title	Author/s	Publication
Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking	Foster Provost and Tom Fawcett	O'Reilly Media
Introduction to Data Science	Cielen, Davy	Dremtech

**Reference Book (s):**

Title	Author/s	Publication
Data Science from Scratch: First Principles with Python	Joel Grus. Publisher	O'Reilly Media
Storytelling with Data: A Data Visualization Guide for Business Professionals	Cole Nussbaumer Knaflic.	Wiley

**Web Material Link(s):**

- [https://onlinecourses.nptel.ac.in/noc25\\_cs20/preview](https://onlinecourses.nptel.ac.in/noc25_cs20/preview)
- <https://pll.harvard.edu/subject/data-science>
- [https://onlinecourses.nptel.ac.in/noc21\\_cs69](https://onlinecourses.nptel.ac.in/noc21_cs69)

**Course Evaluation:****Theory:**

- Continuous Evaluation consists of two tests each of 30 marks and 1 hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

**Practical:**

- Continuous Evaluation consists of the performance of practical, which will be evaluated out of 10 per each practical. At the end of the semester, the average of the entire practical will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/test consists of 30 marks.
- External viva consists of 30 marks.

**Course Outcome(s):**

After the completion of the course, the following course outcomes will be able to:

ICCS8510	Data Science
CO 1	Explain key concepts, significance, and tools of Data Science, including the data science lifecycle, major programming languages (Python, R, SQL), and data structures
CO 2	Apply data collection and preparation techniques using APIs, web scraping, data cleaning, and transformation to build reliable datasets for analysis.
CO 3	Perform exploratory data analysis using descriptive statistics and visualization tools (Matplotlib, Seaborn, Plotly) to summarize and interpret data.
CO 4	Implement core and advanced machine learning models, including regression, classification, clustering, and ensemble learning, with appropriate evaluation and optimization methods.
CO 5	Demonstrate ethical and responsible data practices through real-world capstone projects, integrating data acquisition, model development, visualization, and presentation.

**Mapping of CO with PO**

ICCS8510	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	2	2	1		2	1		1
CO 2	2	3	2	2	3	2		1
CO 3	2	3	2	2	3	2		1
CO 4	3	3	3	3	3	2		1
CO 5	2	2	2	3	3	2	3	2

### Mapping of CO with PSO

ICCS8510	PSO1	PSO2	PSO3
CO 1	2	2	1
CO 2	3	3	1
CO 3	3	3	1
CO 4	3	3	2
CO 5	3	3	3

### Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction to Data Science: Concepts, Significance, and Tools	1,2
2	Data Collection and Preparation Techniques	2,3
3	Exploratory Analytics and Visualization Methods	3,4
4	Core Principles of Machine Learning	2,3,4
5	Advanced Techniques in Machine Learning and Deep Learning	3,4,5
6	Data Presentation and Interactive Visualization	3,5
7	Ethics, Privacy, and Social Impact of Data Science	2,5
8	Practical Applications: Capstone Project and Integration	3,4,5,6

**P P Savani University**  
**School of Engineering**  
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**Department of Computer Science**

Course Code: ICCS8520

Course Name: Data Structures and Algorithms

Prerequisite Course(s): --

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
02	02	-	03	40	60	40	60	-	-	200

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help the learners:

- Understand the principles of data structures and algorithms and analyze their time and space complexity for developing efficient solutions to computational problems.
- Design and implement fundamental data structures and apply them to solve real-world and data science-oriented problems.
- Develop problem-solving and programming skills through the practical implementation of algorithms.
- Prepare students for advanced studies and research in computer science and data science by providing a strong foundation in algorithmic thinking, optimization techniques.

**Course Content:**

Module No.	Content	Hours	Weightage in %
1.	<b>Introduction:</b> Data types – Primitive and Non-primitive, Types of Data Structure, Algorithm: characteristics, specifications, Writing Pseudo-code Algorithm vs Program, Analysis of Algorithm, Methods to measure Time and Space Complexity of Algorithm, Asymptotic Notations to represent the Time complexity & Space complexity of an algorithm.	04	16
2.	<b>Data Structures</b> <b>Array:</b> Representation of arrays, Insert and Delete Operations on Array, Applications of arrays. <b>Stack:</b> Representation of Stack, Operations on Stacks, Applications of Stacks, Polish Expression, Reverse Polish Expression and Their Compilation, Recursion, Tower of Hanoi. <b>Queue:</b> Representation of Queue, Operations on Queue, Circular Queue, Priority Queue, Array representation of Priority Queue, Applications of Queue.	06	17

	<b>Linked List:</b> Singly Linked List, Doubly Linked List, Applications of linked list.		
3.	<b>Trees &amp; Graphs:</b> <b>Trees:</b> Definitions and Concepts, Representation of a binary tree, Binary tree traversal, Binary search trees, AVL tree, B tree, B+ tree, Applications of Trees. <b>Graphs:</b> Introduction, Matrix Representation of Graphs, Graph operations, Graph traversal with BFS and DFS, Applications of Graphs.	06	17
4.	<b>Searching &amp; Sorting Algorithms:</b> Searching Algorithms: Linear Search, Binary Search, Min-Max Problem & its Analysis, Concept of Internal and External Sorting. Sorting Algorithms: Bubble Sort, Insertion Sort, Selection Sort. Binary Search, Merge Sort, Quick Sort, Multiplication of Large Integers.	04	18
5.	<b>Greedy Algorithm</b> Definition, Basic algorithm, and characteristics, Minimum Spanning Tree (MST): Prim's and Kruskal's Algorithm, Fractional Knapsack Problem, Dijkstra's Single source shortest path algorithm, Scheduling Problems, Complexity analysis of all the listed algorithms.	05	16
6.	<b>Dynamic Programming, Hashing Techniques</b> Introduction to Dynamic Programming, Coin Change Problem, 0/1 Knapsack Problem, Traveling Salesman Problem, Floyd's Warshall Algorithm, Chained Matrix Multiplication. Hash function, Address calculation techniques, Common hashing functions, Collision resolution, Linear probing, Quadratic probing, Double hashing.	05	16
	<b>TOTAL</b>	<b>30</b>	<b>100</b>

**List of Practical:**

Sr. No	Name of Practical	Hours
1.	Implement Insertion & Deletion operations on a stack.	02
2.	Implement Stack and Queue operations by using an Array.	02
3.	Implement singly and doubly linked lists.	02
4.	Implement a Binary Tree and perform Insert, Delete, and Traversal Operations.	02
5.	Implement Graph Traversal Techniques.	02
6.	Implement Linear Search & Binary Search Techniques.	02
7.	Implement a program to solve the Min-Max Problem using divide and conquer.	02
8.	Implement and Time analysis of Bubble Sort, Insertion Sort, and Selection Sort.	02
9.	Implement and Time analysis of Quick Sort and Merge Sort.	02
10.	Implement Prim's & Kruskal's algorithm for finding the MST of a graph.	02
11.	Implement the Greedy approach to implement Dijkstra's single-source shortest path algorithm.	02

12.	Implement a solution for the 0/1 Knapsack problem using the Dynamic Programming approach.	02
13.	Implement the Coin Change Problem using dynamic programming.	02
14.	Implement Chained Matrix Multiplication using a dynamic programming approach.	02
15.	Implement a separate chaining collision resolution technique.	02
	<b>TOTAL</b>	<b>30</b>

**Text Book (s):**

Title	Author/s	Publication
Data Structures and Algorithms Made Easy	Narasimha Karumanchi	CareerMonk
An Introduction to Data Structures with Applications.	Jean-Paul Tremblay, Paul G. Sorenson	Tata McGraw-Hill

**Reference Book(s):**

Title	Author/s	Publication
Data Structures Using C	Reema Thareja	Oxford
Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein	MIT Press

**Web material link:**

- <https://nptel.ac.in/courses/106102064>
- <https://www.coursera.org/specializations/data-structures-algorithms#courses>
- [https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-fall-2011/video\\_galleries/lecture-videos/](https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-fall-2011/video_galleries/lecture-videos/)

**Course Evaluation:**

**Theory:**

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

**Practical**

- Continuous Evaluation consists of the performance of practicals, which will be evaluated out of 10 marks for each practical, and the average of the same will be converted to 20 marks.
- Internal viva consists of 20 marks.
- Practical performance/quiz/drawing/test consists of 30 marks during the End Semester Exam.
- Viva/ Oral performance consists of 30 marks during the End Semester Exam.

**Course Outcome(s):**

After the completion of the course, the following course outcomes will be able to:

ICCS8520	DATA STRUCTURES & ALGORITHMS
CO 1	Explain fundamental concepts of data structures and algorithms, including data types, algorithm characteristics, and asymptotic notations for complexity analysis.
CO 2	Analyze algorithms using time and space complexity techniques and represent solutions using pseudo-code.
CO 3	Implement and perform operations on arrays, including insertion, deletion, and real-world applications.
CO 4	Apply stack data structures to solve problems such as expression evaluation (infix, postfix), recursion, and Tower of Hanoi.
CO5	Design and implement queue structures (linear, circular, and priority queues) and apply them to practical problem-solving scenarios.

**Mapping of CO with PO**

ICCS8520	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	3	2	1					
CO 2	3	3	2	2				
CO 3	3	2	3	1				
CO 4	3	3	3	2				
CO 5	3	3	3	2	1			

**Mapping of CO with PSO**

ICCS8520	PSO1	PSO2	PSO3
CO 1	3	1	
CO 2	3	2	
CO 3	3	2	
CO 4	3	2	1
CO 5	3	2	1

**Level of Bloom's Revised Bloom's Taxonomy in Assessment**

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction	1,2,3,5
2	Linear Data Structures	1,2,3,5
3	Trees & Graphs	1,2,3,4,6
4	Searching & Sorting Algorithms	1,2,3,5,6
5	Divide and Conquer Techniques	1,2,3,6
6	Greedy Algorithm	1,2,3,4,5,6
7	Dynamic Programming	1,2,3,4,5,6
8	Hashing Techniques	1,2,3,4,5

**P P Savani University**  
**School of Engineering**  
**Institute of Computer Science and Application**

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**Department of Computer Science**

Course Code: ICCS8060  
 Course Name: Online Course-II  
 Prerequisite Course(s): --

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	-	-	03	100	0	-	-	-	-	100

CE: Continuous Evaluation, ESE: End Semester Exam

**Objective(s) of the Course:**

To help the learners to

- Learn new subjects as per recent trends in the industry from national experts.

**Course Content:**

Performance analysis will be based on any one of the following subjects:

1. Natural Language Processing
2. Big Data
3. Generative AI
4. Blockchain Technology
5. Computer Vision
6. Cloud Computing
7. Digital Image Processing
8. Internet of Things
9. Augmented Reality
10. Real time systems
11. Compiler Design
12. Data Visualization
13. Reinforcement Learning
14. GPU Architectures and Programming
15. DevOps and Agile Foundation

Or any other NPTEL course; available time to time.

**Course Evaluation:**

**Practical**

- Continuous Evaluation as per the guidelines of NPTEL assignments and tests.
- The NPTEL score will be directly fetched and converted out of 100.

**Course Outcome(s):**

After completion of the course, the student will be able to

<b>ICCS8060</b>	<b>Online Course-II</b>
C01	Inculcate mode of self-learning.
C02	Exposure to relevant and newest tools and technologies.
C03	Value addition when the student is applying for jobs.
C04	Use NPTEL program for GATE and high studies preparation.
C05	Facilitate students to attain certificate and to make them employable in the industry or pursue higher education program.

**Mapping of CO with PO**

<b>ICCS8060</b>	<b>P01</b>	<b>P02</b>	<b>P03</b>	<b>P04</b>	<b>P05</b>	<b>P06</b>	<b>P07</b>	<b>P08</b>
C01		1						3
C02	1	2	2		3	3		2
C03	1	2	2		2	2	2	2
C04	1	2		1	1			3
C05	1	2	2	1	2	2	2	3

**Mapping of CO with PSO**

<b>ICCS8060</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
C01			3
C02	2	2	2
C03	2	2	2
C04	1	1	3
C05	2	2	3

**Level of Bloom's Revised Bloom's Taxonomy in Assessment**

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

<b>Module No</b>	<b>Content</b>	<b>RBT Level</b>
1.	Online Course	1,2,3,4,5,6

**P P Savani University**  
**School of Engineering**  
**Institute of Computer Science and Application**

**Department of Computer Science**

Course Code: ICCS8920

Course Name: Dissertation/ Major Project

Prerequisite Course(s): - -

**Teaching & Examination Scheme:**

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
-	20	-	20	-	-	200	300	-	-	500

CE: Continuous Evaluation, ESE: End Semester Exam

**Outline of the Course:**

**Project**

- The project will be aligned with the aims of the engineering Programme and its areas of specialization and shall be based on the recent trends in technology.
- The student shall carry out a comprehensive project at relevant academic / R&D / industrial organization.
- The student is required to submit a project report based on the work carried out.

**Training**

- The aim of this course is to use the internship experience to enable students to develop their engineering skills and practices.
- The student will be placed in industry/organization for 12 to 18 weeks and assessed for academic credit.
- The students may select industry on their own or one which is offered by institute.
- Students are expected to experience a real-life engineering workplace and understand how their engineering and professional skills can be utilized in industry.
- The student is required to submit a project report based on the work carried out.

**Course Outcome(s):**

After completion of the course, the student will be able to

<b>ICCS8920</b>	<b>Dissertation/Major Project</b>
C01	Facilitate theoretical learning through practical applications, while fostering team-building to integrate knowledge effectively for engineering applications.
C02	Adapt to real time industry exposure and experience
C03	Solve challenging projects for commercial, societal and environment benefit.
C04	Explain the importance of planning, documentation, punctuality, and work ethics.
C05	Document the work which is carried out in proper format with industry standards.

### Mapping of CO with PO

ICCS8920	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
C01	2	2	2	3	1		3	
C02	3	1	1	1		2	3	1
C03	3	3	2	3		3		
C04								
C05		1						

### Mapping of CO with PSO

ICCS8920	PSO1	PSO2	PSO3
C01	3	2	2
C02	3	2	3
C03	3	3	3
C04	2		3
C05	3		3



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