

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SILVER JUBILEE INSTITUTION

(Affiliated to Bharathidasan University)

(Accredited by NAAC)

SUNDARAKKOTTAI, MANNARGUDI –614016, TAMILNADU, INDIA.



M.Sc., INFORMATION TECHNOLOGY

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK

(CBCS-LOCF)

(For the candidates admitted in the academic year 2026–2027)

PROGRAMME CODE

2PSINT



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TAMILNADU, INDIA.

M.Sc., INFORMATION TECHNOLOGY CHOICE BASED CREDIT SYSTEM - LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)

(For the candidates admitted in the academic year 2026-2027)

CHOICE BASED CREDIT SYSTEM

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. Our College has moved to CBCS and implemented the grading system.

OUTCOME-BASED EDUCATION (OBE)

LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (LOCF)

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that higher education qualifications are awarded on the basis of demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and academic standards expected of graduates of a programme of study. Learning outcomes specify what graduates completing a particular programme of study are expected to know, understand and be able to do at the end of their programme of study. The expected learning outcomes are used as reference points that would help to formulate graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes which in turn will help in curriculum planning and development, and in the design, delivery and review of academic programmes. They provide general guidance for articulating the essential learning associated with programmes of study and courses within a programme, maintain national standards and international comparability of learning outcomes and academic standards to ensure global competitiveness, and to facilitate student/graduate mobility and provide higher education institutions an important point of reference for designing teaching-learning strategies, assessing student learning levels, and periodic review of programmes and academic standards.

Some important aspects of the Outcome Based Education

Course: is defined as a theory, practical or theory cum practical subject studied in a semester.

Course Outcomes (COs): Course Outcomes are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course. Generally three or more course outcomes may be specified for each course based on its weightage.

Programme: is defined as the specialization or discipline of a Degree.

Programme Outcomes (POs): Programme outcomes are narrower statements that describe what students are expected to be able to do by the time of graduation. POs are expected to be aligned closely with Graduate Attributes.

Programme Specific Outcomes (PSOs): PSOs are what the students should be able to do at the time of graduation with reference to a specific discipline.

Some important terminologies repeatedly used in LOCF.

Core Courses (CC): A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. These are the courses which provide basic understanding of their main discipline. In order to maintain a requisite standard certain core courses must be included in an academic program. This helps in providing a universal recognition to the said academic program.

Discipline Centric Elective Courses (DCEC): Elective course may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective (DSE). These courses offer the flexibility of selection of options from a pool of courses. These are considered specialized or advanced to that particular programme and provide extensive exposure in the area chosen; these are also more applied in nature.

Discipline Centric Elective Practical (DCEP): **Discipline Centric Elective Practical (DCEP):** An elective practical course offered by the parent discipline/subject of study. These practical courses provide flexibility through a choice of options from a pool of practical subjects. They are specialized and advanced in nature, offering extensive hands-on experience and application-oriented learning in the selected area. **DCEP courses shall be offered only in Semesters I, II, and III.**

Generic Elective Courses: An elective course chosen generally from an **unrelated discipline/subject**, with an intention to seek exposure is called a Generic Elective. Generic Elective courses are designed for the students of other disciplines. Thus, as per the CBCS policy, the students pursuing particular disciplines would have to opt Generic Elective courses offered by other disciplines, as per the basket of courses offered by the college. The scope of the Generic Elective (GE) Courses is positively related to the diversity of disciplines in which programmes are being offered by the college.

Non Major Elective Course (NMEC): A student shall choose at least two Non-major Elective(NMEC) Courses from outside his/her department.

Skill Enhancement Courses (SECs): These courses focus on developing skills or proficiencies in the student, and aim at providing hands-on training. Skill enhancement courses can be opted by the students of any other discipline, but are highly suitable for students pursuing their academic programme. These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

Field Study/Industrial Visit/Case Study: It has to be completed during the fifth semester of the degree programme. Credit for this course will be entered in the fifth semester's marks statement.

Internship: Students must complete internship during summer holidays after the fourth semester. They have to submit a report of internship training with the necessary documents and have to appear for a viva-voce examination during fifth semester. Credit for internship will be entered in the fifth semester's mark statement.

Extra Credit Courses: In order to facilitate the students, gaining knowledge/skills by attending online courses MOOC, credits are awarded as extra credits, the extra credit are at three semesters after verifying the course completion certificates. According to the guidelines of UGC, the students are encouraged to avail this option of enriching their knowledge by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals such as SWAYAM, NPTEL etc.

EXAMINATION

Continuous Internal Assessment (CIA):

PG - Distribution of CIA Marks Passing Minimum: 50 % Assignments – 3 = 30%
Tests – 2 = 50%

Seminar = 10 % Attendance = 10 %

Question Paper Pattern

Part A: Includes two subsections

Part A1 (10X1=10 marks)

One word question/ Fill in/ /True or False/ Multiple Choice Questions Two Questions from Each unit

Part A2 (5X2=10 marks) Match the following Short Answers

One question from Each unit

Total Marks - 20

Part B: (5X4=20 marks) Paragraph Answers

Either/ or type, One Question from each unit

Part C: (10X3=30)

Essay Type Answers Answer 3 out of 5 Questions One Question from each unit

Part A: K1 Level

Part B: K2, K3 and K4 Level

Part C: K5 and K6 Level

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

S.No.	Level	Parameter	Description
1	K1	Knowledge / Remembering	It is the ability to remember the previously learned
2	K2	Comprehension / Understanding	The learner explains ideas or concepts
3	K3	Application /Applying	The learner uses information in a new way
4	K4	Analysis /Analyzing	The learner distinguishes among different parts
5	K5	Evaluation /Evaluating	The learner justifies a stand or decision
6	K6	Synthesis /Creating	The learner creates a new product or pointof view

WEIGHTAGE of K –LEVELS IN QUESTION PAPER

(Cognitive Level) K-LEVELS →	Lower Order Thinking			Higher Order Thinking			Total
	K1	K2	K3	K4	K5	K6	
END SEMESTER EXAMINATIONS (ESE)	20	20			30		70
Continuous Internal Assessment (CIA)	20	20			30		70

QUESTION PATTERN FOR END SEMESTER EXAMINATION/ Continuous Internal Assessment		
PART		MARKS
PART – A I. (No choice ,One Mark) TWO questions from eac unit	(10x1=10 (5x2=10))	20
II. (No choice, Two Mark) ONE question from each unit		
PART – B (Either/ or type,4-Marks) ONE question from eac unit	(5x4=20)	20
PART – C (3 out of 5) (10Marks) ONE question from each unit	(3x10=30)	30
Total		70

BLUE PRINT OF QUESTION PAPER FOR END SEMESTER EXAMINATION							
DURATION: 3.00 Hours. :70						Max Mark	
K-LEVELS	K1	K2	K3	K4	K5	K6	Total Marks
PART							
PART –A (One Mark, No choice) (10x1=10) (2-Marks,No choice) (5x2=10)	10						10
	10						10
PART –B (4-Marks)(Either/or type) (5x4=20)		5	5	10			20
PART –C (10 Marks)(3 out of 5) (3x10=30) Courses having only K5,K6 levels, K5 level- 3 Questions, K6 level- 2 Questions (One K6 level question is compulsory)					20	10	30
Total	20	05	05	10	20	10	70

EVALUATION

GRADING SYSTEM

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added and converted as final mark. The marks thus obtained will then be graded as per the scheme provided in Table-1.

Grade Point Average (GPA) will be calculated from the first semester onwards for all semester. From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA), respectively. These two are calculated by the following formulae:

I=1	I=1
Where, C_i is the Credit earned for the Course i G_i is the Grade Point obtained by the student for the Course i M_i is the marks obtained for the course i and n is the number of Courses Passed in that semester.	

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

CLASSIFICATION OF FINAL RESULTS:

- The classification of final results shall be based on the CGPA, as indicated in Table-2.
- For the purpose of Classification of Final Results, the candidates who earn the CGPA 9.00 and above shall be declared to have qualified for the Degree as 'Outstanding'. Similarly the candidates who earn the CGPA between 8.00 and 8.99, 7.00 and 7.99, 6.00 and 6.99 and 5.00 and 5.99 shall be declared to have qualified for their Degree in the respective programmes as 'Excellent', 'Very Good', 'Good', and 'Above Average' respectively.
- Absence from an examination shall not be taken an attempt.

Table- 1: Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above and below 90	9	A+
70 and above and below 80	8	A
60 and above and below 70	7	B+
50 and above and below 60	6	B
Below 50	NA	RA

NA- Not Applicable, RA- Reappearance

The candidates performance in every current semester is indicated by **Semester Grade Point Average (SGPA)** and from the second semester onwards, the continuous performance including previous semester/s is indicated by **Cumulative Grade Point Average (CGPA)**

Table-2: Final Result

CGPA	Corresponding Grade	Classification of Final Result
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average

* The candidates who have passed in the first appearance and within the prescribed duration of the PG Programme are eligible. If the candidate's Grade is O/A+ with more than one attempt, the performance is fixed as "Very Good".

Vision

Attaining Global Recognition in Computer Science Education and to Develop the Software Professionals

Mission

Imparting Quality Education through a Well – Designed Curriculum in tune with the Challenging Software Needs of the Industry

PROGRAMME OUTCOMES FOR M.Sc., DEGREE PROGRAMMES

PO.No	Programme Outcomes <i>(Upon completion of the M.Sc., Degree Programme, the Post graduate will be able to)</i>
PO-1	Disciplinary Knowledge: demonstrate in-depth knowledge and understanding of theories, policies, and practices in one or more disciplines that form a part of a PostGraduate program of study in Master of Science.
PO-2	Critical Thinking and Problem Solving: apply analytic thought to a body of knowledge, analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence, identify relevant assumptions or implications, formulate coherent arguments, critically evaluate practices, policies and theories by following scientific approach to knowledge development: solve problems and extrapolate the same to real life situation
PO-3	Information/digital literacy and Communication Skills: use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources, and use appropriate software for analysis of data: communicate thoughts and ideas analytically and effectively in writing and orally using appropriate media, and present complex information in a clear and concise manner to different groups.
PO-4	Research-related skills: conduct independent inquiry in a chosen scientific discipline, demonstrate sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesizing and articulating; recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; plan, execute and report the results of an experiment or investigation.
PO-5	Scientific reasoning and Reflective Thinking: analyse, interpret and draw conclusions from quantitative/qualitative data and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective; critically and sensibly evaluate life experiences, with self awareness and reflexivity of both self and society.
PO-6	Multidisciplinary Approach, Innovation and Entrepreneurship: propose novel ideas of interdisciplinary approach in providing better solutions and new ideas for the sustainable developments; identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.
PO-7	Moral and ethical awareness/reasoning: embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work, demonstrate the ability to identify ethical issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights, appreciate environmental and sustainability issues, and adopt objective, unbiased and truthful actions in all aspects of work.
PO-8	Self directed Learning: work independently, identify appropriate resources required for a project, and manage a project till completion.
PO-9	Lifelong Learning: engage in continuous learning for professional growth and development, acquire knowledge and skills, adapt to changing environment and to changing trades and demands of work place through knowledge/skill development/reskilling.
PO-10	Multicultural Competence, Social Interaction and Effective Citizenship: understand the values and beliefs of multiple cultures, global perspectives, engage and interact respectfully with diverse groups and elicit views of others, mediate disagreements and help reach conclusions in group settings, and demonstrate empathetic social concern and equity centred national development

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO No.	Program Specific Outcomes (M.Sc., Information Technology)
PSO1:	Apply mathematical foundations, algorithmic principles, and computer science theory the modeling and design of computer-based systems of varying complexity.
PSO2:	Explore the concepts and theories behind computer science to develop innovative software applications.
PSO3:	Apply the latest trends in technology to design, develop and test software applications for specific needs.
PSO4:	Plan and take part in continuous learning and deliver efficient solutions for emerging challenges in the computation domain.
PSO5:	Implement new development tools, software framework, middleware, programming language or methodology to aid in the development of software projects.
PSO6:	Apply and Implement the working of compilers which also tends towards system programming and using various components to implement an efficient scalable software solution in the form of web application.
PSO7:	Understand the interdisciplinary nature of data, information and communications and learn new languages quickly.

Sem.	Course	Course Code	Course Title	Ins. Hrs.	Credit	Exam Hrs.	Marks		Total
							Int.	Ext.	
I	Core Course - I (CC -I)	P26IT101	Object Oriented Systems Development	6	4	3	30	70	100
	Core Course - II (CC - II)	P26IT102	Python Programming	6	4	3	30	70	100
	Core Practical -I (CP - I)	P26IT103P	Python Programming Lab	4	4	3	40	60	100
	Discipline Centric Elective Course - I (DCEC-I)	P26ITDE11A/ P26ITDE11B/ P26ITDE11C	Mobile Computing	5	4	3	30	70	100
			Advanced Data Structures						
			Problem Solving using R						
	Discipline Centric Elective Practical - I (DCEP - I)	P26ITDE12AP/ P26ITDE12BP/ P26ITDE12CP	Mobile Computing Lab	2	2	3	40	60	100
			Advanced Data Structures Lab						
			Problem Solving using R Lab						
	Generic Elective Course – I (GEC - I)	P26ITGE11A/ P26ITGE11B/ P26ITGE11C	E- Commerce	5	3	3	30	70	100
			Advanced Software Engineering						
Green Computing									
Skill Enhancement Course - I (SEC - I)	P26SEIT11	React JS	2	2	3	30	70	100	
Value Added Course – I (VAC - I)*	P26ITVA11	Advanced AI Applications in Computer Science	-	2*	2	30	70	100*	
Total				30	23	-	-	-	700
II	Core Course - III (CC -III)	P26IT204	Advanced Database Management Systems	6	4	3	30	70	100
	Core Course – IV(CC -IV)	P26IT205	Cryptography and Network Security	6	4	3	30	70	100
	Core Practical - II (CP - II)	P26IT206P	Advanced Database Management Systems Lab	4	4	3	40	60	100
	Discipline Centric Elective Course - II (DCEC - II)	P26ITDE23A/ P26ITDE23B/ P26ITDE23C	Data Mining Techniques and Tools	4	4	3	30	70	100
			Digital Watermarking and Steganography						
			Web Programming						
	Discipline Centric Elective Practical –II (DCEP - II)	P26ITDE24AP/ P26ITDE24BP/ P26ITDE24CP	Data Mining Techniques and Tools Lab	2	2	3	40	60	100
			Digital Watermarking and Steganography Lab						
			Web Programming Lab						
	Generic Elective Course – II (GEC - II)	P26ITGE22A/ P26ITGE22B/ P26ITGE22C	Wireless Networks	4	3	3	30	70	100
Big Data Frameworks									
Internet of Things									

	Skill Enhancement Course - II (SEC - II)	P26SEIT22	Node JS	2	2	3	30	70	100
	Non-Major Elective Course – I (NMEC - I)	P26NMECS21	Internet and Web Basics	2	2	3	30	70	100
	Total			30	25	-	-	-	800
Summer Internship / Industrial Activity during the Summer Vacation after 1 st Year									
III	Core Course - V (CC - V)		.NET Programming	6	4	3	30	70	100
	Core Course - VI (CC -VI)		Blockchain Technology	6	4	3	30	70	100
	Core Practical – III (CP - III)		.NET Programming Lab	4	4	2	40	60	100
	Discipline Centric Elective Course - III (DCEC - III)		Full Stack Development	5	4	3	30	70	100
			Natural Language Processing						
			Advanced Operating Systems						
	Discipline Centric Elective Practical - III (DCEP - III)		Full Stack Development Lab	2	2	2	40	60	100
			Natural Language Processing Lab						
			Advanced Operating Systems Lab						
	Generic Elective Course – III (GEC - III)		Software Metrics	5	3	3	30	70	100
			Intelligent Systems						
			Research Methodology and IPR						
	Non-Major Elective Course - II (NMEC - II)		Fundamentals of Cloud Computing	2	2	3	30	70	100
Summer Internship / Industrial Activity @				2		20	80	100	
Value Added Course – II (VAC - II)*		Web Development	-	2*	2	30	70	100*	
Total			30	25	-	-	-	800	
IV	Core Course – VII (CC - VII)		J2EE Technologies	6	4	3	30	70	100
	Core Course - VIII (CC - VIII)		Artificial Intelligence and Machine Learning	6	4	3	30	70	100
	Core Practical –IV (CP - IV)		J2EE Technologies Lab	6	4	3	30	70	100
	Discipline Centric Elective Course - IV (DCEC - IV)		Ethical Hacking	4	4	2	30	70	100
			Cloud Computing						
			Computer Vision						
	Entrepreneurship / Industry Based Course		Startups and Entrepreneurship	3	3	3	30	70	100
	Project Work @			5	5	-	20	80	100
	Extra credit course*		Two credit for each VAC and NPTEL /SWAYAM/MOOC*		2*				
Total			30	24	-	-	-	600	
Grand Total			120	97	-	-	-	2900	

LIST OF DISCIPLINE CENTRIC ELECTIVE COURSE

Discipline Centric Elective Course - I (DCEC - I)	
1.	Mobile Computing
2.	Advanced Data Structures
3.	Problem Solving using R
Discipline Centric Elective Course - II (DCEC - II)	
1.	Data Mining Techniques and Tools
2.	Digital Watermarking and Steganography
3.	Web Programming
Discipline Centric Elective Course - III (DCEC - III)	
1.	Full Stack Development
2.	Natural Language Processing
3.	Advanced Operating Systems
Discipline Centric Elective Course - IV (DCEC - IV)	
1.	Ethical Hacking
2.	Cloud Computing
3.	Computer Vision

LIST OF GENERIC ELECTIVE COURSE (GEC)

GENERIC ELECTIVE COURSE - I (GEC - I)	
1.	E- Commerce
2.	Advanced Software Engineering
3.	Green Computing
GENERIC ELECTIVE COURSE - II (GEC - II)	
1.	Wireless Networks
2.	Big Data Frameworks
3.	Internet of Things
GENERIC ELECTIVE COURSE - III (GEC - III)	
1.	Software Metrics
2.	Intelligent Systems
3.	Research Methodology and IPR

SUMMARY OF CURRICULUM STRUCTURE OF PG PROGRAMMES: SCIENCE

Sl. No.	Types of the Course	No. of Courses	Credits for each Course	Total Credits	Marks
1.	Core Course (CC)	8	4	32	800
2.	Core Practical(CP)	4	4	16	400
3.	Discipline Centric Elective Course (DCEC)	4	4	16	400
4.	Discipline Centric Elective Practical(DCEP)	3	2	6	300
5.	Generic Elective Course (GEC)	3	3	9	300
6.	Skill Enhancement Course(SEC)	2	2	4	200
7.	Non-Major Elective Courses (NMEC)	2	2	4	200
8.	Internship / Industrial Activity @	1	2	2	100
9.	Entrepreneurship / Industry Based Course	1	3	3	100
10.	Project Work @	1	5	5	100
Total		29	-	97	2900
Value Added Courses *		2*	2	4*	200

*	The value added courses credit will not be included in the total CGPA . These courses are extra-credit courses. Instruction hours for these courses is 30 hours								
@	Summer Internship will be carried out during the summer vacation after the First year. Viva Voce will be conducted by the college and Marks shall be sent to the University and the same will be included in the 3rd semester Mark Statement. Summer Internship / Industrial Activity& Project Scheme of Evaluation: <table border="1"> <tr> <th>Description</th><th>Marks</th></tr> <tr> <td>Report</td><td>80</td></tr> <tr> <td>Viva</td><td>20</td></tr> <tr> <td>Total</td><td>100</td></tr> </table>	Description	Marks	Report	80	Viva	20	Total	100
Description	Marks								
Report	80								
Viva	20								
Total	100								

SEMESTER I

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE



(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI - 614016.

(For the candidates admitted in the academic year 2026 – 2027)

PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: I-CC-I - OBJECT ORIENTED SYSTEMS DEVELOPMENT

Ins. Hrs. /Week: 6

Course Credit: 4

Course Code:P26IT101

COURSE OBJECTIVES

- To provide knowledge of object-oriented concepts and software development methodologies.
- To understand object-oriented modelling techniques and develop system models using UML.
- To analyze software requirements and identify classes, relationships, attributes, and methods using object-oriented analysis.
- To design object-oriented software systems using design principles, patterns, and layered architecture.
- To develop understanding of software quality assurance, testing strategies, usability, and user satisfaction evaluation.

UNIT – I FUNDAMENTALS OF OOSD

(18 Hours)

Overview of Object Oriented Systems Development: Two orthogonal view of the software - OOSD methodology - Object basics: Object Oriented Philosophy- Objects – Attributes – Object respond to messages – Encapsulation and information hiding – class hierarchy – Polymorphism – Object relationship and associations. OOSD life cycle: Software development process – OOSD Use case Driven Approach – Reusability.

UNIT – II METHODOLOGY, MODELLING AND UML

(18 Hours)

Object Oriented Methodologies: Rumbaugh et al.'s object modelling technique – The Booch methodology – The Jacobson et al. methodology – Patterns – Frameworks - The Unified approach. Unified Modelling Language : Static and dynamic models -- UML diagrams – UML class diagram – Use case diagram - UML dynamic modelling – packages and model organization.

UNIT – III OBJECT ORIENTED ANALYSIS

(18 Hours)

Object Oriented Analysis process: Business Object Analysis - Use case driven - object oriented analysis – Business process modelling – Use-Case model – Developing effective documentation. Classification: Classifications theory – Approaches for identifying classes – Noun phrase approach – Common class patterns approach – Use-Case Driven approach – Classes, Responsibilities, and Collaborators - Naming classes. Identifying object relationships, attributes, and methods: Association – Super-Sub class relationship – Aggregation – Class responsibility – Object responsibility.

UNIT – IV OBJECT ORIENTED DESIGN

(18 Hours)

Object Oriented Design Process and Design Axioms - OOD process- OOD axioms – Corollaries – Design patterns. Designing classes: Designing classes – Class visibility – Refining attributes – Designing methods and protocols – Packages and managing classes. Access layer: Object Store and persistence – DBMS – Logical and physical Database Organization and access control – Distributed Databases and Client Server Computing – Multi database Systems – Designing Access layer classes. View Layer: Designing view layer

classes – Macro level process – Micro level process – The purpose of view layer interface – Prototyping the user interface.

UNIT – V SOFTWARE QUALITY:

(18 Hours)

Software Quality Assurance: Quality assurance tests – Testing strategies – Impact of Object Orientation on Testing - Test Cases- Test Plan – Continuous testing. System Usability and Measuring User satisfaction: Usability Testing – User satisfaction test – A tool for analyzing user satisfaction. System Usability and Measuring User satisfaction: Introduction – Usability Testing.

UNIT – VI: CURRENT CONTOURS (For Continuous Internal Assessment Only)

Agile and DevOps practices in object-oriented software development -Model Driven-Architecture (MDA) and automated software modelling -Cloud-based software design and distributed applications .

Total Lecture Hours : 90

COURSE OUTCOME

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

1. Explain the concepts of object-oriented software development and apply OOSD methodologies in software projects.
2. Develop software models using UML diagrams and apply object-oriented methodologies for system modelling.
3. Perform object-oriented analysis to identify classes, relationships, responsibilities, and use cases for software systems.
4. Design software systems using object-oriented design principles, patterns, access layers, and view layers.
5. Apply software quality assurance techniques, testing methods, and usability evaluation to improve software quality.
6. Analyze contemporary trends and emerging technologies related to object-oriented software development and software engineering practices.

TEXT BOOKS

1. Object-Oriented Systems Development – Ali Bahrami, McGraw-Hill Education.
2. Applying UML and Patterns – Craig Larman, Pearson Education.
3. Object-Oriented Analysis and Design with Applications – Grady Booch, Addison-Wesley.
4. The Unified Software Development Process – Ivar Jacobson, Grady Booch and James Rumbaugh, Addison-Wesley.
5. Object Management Group Unified Modeling Language Specification – OMG Press.

REFERENCE BOOKS

1. Head First Object-Oriented Analysis and Design – O'Reilly Publications.
2. Design Patterns: Elements of Reusable Object-Oriented Software – Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides.
3. UML Distilled – Addison-Wesley.
4. Booch Grady, Rumbaugh James, Jacobson Ivar, "The Unified modeling Language – User Guide, Pearson Education, 2006
5. Brahma Dathan, Sarnath Ramnath, "Object Oriented Analysis, Design and Implementation", Universities Press, 2010.
6. Mahesh P.Matha, "Object-Oriented Analysis and Design Using UML", PHI Learning Private Limited, 2012.
7. Rachita Misra, Chhabi Rani Panigrahi, Bijayalaxmi Panda, "Principles of Software Engineering and System Design", Yesdee Publishing 2019.

E_RESOURCES

1. <https://www.tutorialspoint.com/object-oriented-analysis-design/ooad-object-oriented-system.htm>
2. <https://www.w3computing.com/systemsanalysis/object-oriented-systems-analysis-design/>
3. <https://www.geeksforgeeks.org/steps-to-analyze-and-design-object-oriented-system/>

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
	CO1	2	2	3	3	3	2	3	3	3	3	3	3	3	3	3	3
	CO2	1	3	3	3	3	2	3	3	2	3	2	3	3	3	3	3
	CO3	2	3	3	3	3	2	3	3	3	3	3	3	3	2	3	3
	CO4	3	3	3	3	3	2	3	3	3	3	2	3	3	3	3	2
	CO5	3	3	3	3	3	2	3	3	1	3	3	3	3	3	3	2
	S-Strong (3)			M-Medium (2)			L-Low (1)										

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE



(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI - 614016.

(For the candidates admitted in the academic year 2026 – 2027)

PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: I-CC-II - PYTHON PROGRAMMING

Ins. Hrs. /Week: 6

Course Credit: 4

Course Code: P26IT102

COURSE OBJECTIVES

- To introduce the fundamental concepts of computer science and Python programming constructs.
- To develop problem-solving skills using strings, functions, recursion, lists, and dictionaries.
- To understand object-oriented programming concepts and design applications using classes and GUI components.
- To gain practical knowledge of Python packages such as NumPy, Pandas, and Matplotlib for data analysis and visualization.
- To enable students to design and develop web applications using the Django framework.

UNIT I INTRODUCTION

(18 Hours)

Fundamental ideas of Computer Science - Strings, Assignment, and Comments - Numeric Data types and Character sets – Expressions – Loops and Selection Statements: Definite iteration: the for Loop - selection: if and if-else statements - Conditional iteration: the while Loop.

UNIT II STRINGS AND TEXT

(19 Hours)

Accessing Characters and substrings in strings - Data Encryption-Strings and Number systems- String methods – Text - Lists and Dictionaries: Lists – Dictionaries – Design with Functions: A Quick review- Problem Solving with top-Down Design - Design with recursive Functions - Managing a Program's namespace - Higher-Order Functions.

UNIT III DESIGN WITH CLASSES

(20 Hours)

Getting inside Objects and Classes – Data-Modeling Examples – Building a New Data Structure – The Two – Dimensional Grid - Structuring Classes with Inheritance and Polymorphism - Graphical User Interfaces - The Behavior of terminal-Based programs and GUI-Based programs - Coding Simple GUI-Based programs - Windows and Window Components - Command Buttons and responding to events.

UNIT IV WORKING WITH PYTHON PACKAGES

(17 Hours)

NumPy Library-Nd array – Basic Operations – Indexing, Slicing and Iteration – Array manipulation Pandas –The Series – The Data Frame - The Index Objects – Data Visualization with Matplotlib – The Matplotlib Architecture – pyplot – The Plotting Window – Adding Elements to the Chart – Line Charts– Bar Charts – Pie charts.

UNIT-V DJANGO

(16 Hours)

Installing Django – Building an application – Project Creation – Designing the Data Schema - Creating an administration site for models - Working with Query Sets and Managers – Retrieving Objects – Building List and Detail Views.

Introduction to Cloud Deployment for Python Applications- Real-Time Data Visualization Techniques- Case Studies on Python Applications in Web Development, Data Science and Automation.

Total Lecture Hours : 90

Total Lecture Hours : 90

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

1. Comprehend the programming skills in python and develop applications using conditional branches and looping
2. Create python applications with strings and functions
3. Understand and implement the Object Oriented Programming paradigm with the concept of objects and classes, Inheritance and polymorphism
4. Evaluate the use of Python packages to perform numerical computations and data visualization
5. Design interactive web applications using Django
6. Evaluate case studies related to Python applications in web development, data science and automation.

1. Antonio Mele, “Django 3 By Example”, Third Edition, 2020.
2. Fabio Nelli, “Python Data Analytics: With Pandas, NumPy, and Matplotlib”, Second Edition, Kindle Edition, 2018.
3. K.A. Lambert, “Fundamentals of Python: first programs”, Second Edition, Cengage Learning, 2018.

1. Jeff McNeil , “Python 2.6 Text Processing: Beginners Guide”, Packet Publications, 2010.
2. Mark Pilgrim, “Dive Into Python” , 2nd edition, Apress, 2009.

1. <https://www.computer-pdf.com/>
2. <https://rb.gy/mnhgz5>
3. <http://www.oreilly.com/programming/free/functional-programming-python.csp>

COURSE UTCOME	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	1	3	3	3	3	3	3	3
S-Strong (3)						M-Medium (2)					L-Low (1)						

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: I-CP-I - PYTHON PROGRAMMING LAB

Ins. Hrs. /Week: 4

Course Credit: 4

Course Code:P26IT103P

COURSE OBJECTIVES

- To understand the fundamentals of R programming for statistical computing and data analysis.
- To learn data handling, preprocessing and visualization techniques using R.
- To apply statistical and machine learning techniques using R programming.
- To develop analytical skills for solving real-world data science problems.
- To implement predictive models and data mining applications using R tools and packages.

EXERCISES

1. Program using elementary data items, lists, dictionaries and tuples
2. Program using conditional branches, loops
3. Program using functions
4. Program using classes and objects
5. Program using inheritance
6. Program using polymorphism
7. Program using Numpy
8. Program using Pandas
9. Program using Matplotlib
10. Program for creating dynamic and interactive web pages using forms

Total Lecture Hours : 60

COURSE OUTCOME

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

1. Comprehend the programming skills in python and write scripts
2. Create python applications with elementary data items, lists, dictionaries and tuples
3. Implement the Object Oriented Programming concepts such as objects and classes, Inheritance and polymorphism
4. Assess the use of Python packages to perform numerical computations and perform data visualization
5. Create interactive web applications using Django
6. Apply R programming for numerical computations, matrix operations and data preprocessing.

TEXT BOOKS

1. Hadley Wickham and Garrett Grolemund, *R for Data Science*, O'Reilly Media, 2017.
2. Norman Matloff, *The Art of R Programming*, No Starch Press, 2011.
3. Tilman M. Davies, *The Book of R: A First Course in Programming and Statistics*, No Starch Press, 2016.

REFERENCE BOOKS

1. Jared P. Lander, *R for Everyone: Advanced Analytics and Graphics*, 2nd Edition, Addison-Wesley Professional, 2017.
2. Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani, *An Introduction to Statistical Learning with Applications in R*, Springer, 2021.
3. Roger D. Peng, *R Programming for Data Science*, Leanpub Publications, 2016.
4. Andrie de Vries and Joris Meys, *R for Dummies*, Wiley Publishing, 2015.
5. Brett Lantz, *Machine Learning with R*, 3rd Edition, Packt Publishing, 2019.

E-RESOURCES

1. https://www.geeksforgeeks.org/r-programming-language-introduction/?utm_source=chatgpt.com
2. https://posit.co/products/open-source/rstudio/?utm_source=chatgpt.com

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
	CO1	3	2	3	2	3	3	2	3	3	3	3	3	3	2	3	3	3
	CO2	3	3	3	3	3	3	2	3	3	2	3	2	3	3	3	3	3
	CO3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	3	3
	CO4	3	3	3	3	3	3	2	3	3	3	3	2	3	3	3	3	2
	CO5	3	3	2	3	3	3	3	3	1	3	3	3	3	3	2	3	2
S-Strong (3)						M-Medium (2)					L-Low (1)							

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: I–DCEC-I (A) - MOBILE COMPUTING

Ins. Hrs. /Week:5

Course Credit:4

Course Code:P26ITDE11A

COURSE OBJECTIVES

1. To introduce the concepts, architecture, and technologies involved in mobile computing systems.
2. To understand mobile communication technologies including GSM, GPRS, and wireless network services.
3. To develop knowledge of mobile network operations, security mechanisms, and mobile data communication.
4. To provide practical understanding of Android application development and user interface design.
5. To enable students to develop mobile applications using Flutter and Dart programming concepts.

UNIT I INTRODUCTION

(15 Hours)

Mobile Computing-Mobility of Bits and Bytes – Networks – Middleware and Gateways – Developing Mobile Computing Applications–Mobile Computing Architecture: Architecture for Mobile Computing–Three-Tier Architecture-Mobile Computing through Internet–Emerging Technologies: Bluetooth – Radio Frequency Identification (RFID) -Wireless Broadband (WIMAX)- Mobile IP – Internet Protocol Version6 (IPV6)- Java Card.

UNIT II GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS (GSM)

(15 Hours)

Global System for Mobile Communications - GSM Architecture–GSM Entities-Call Routing in GSM– GSM Addresses and Identifiers – Network Aspecting GSM –Mobility Management - GSM Frequency Allocation – Authentication and Security-Short Message Service (SMS): Mobile Computing Over SMS– Value Added Services through SMS- MMS.

UNIT III GENERAL PACKET RADIO SERVICE (GPRS)

(15 Hours)

Introduction - GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS - Applications for GPRS–Limitations of GPRS.– Wireless Data– Third Generation Networks – Applications on 3G.

UNIT IV GETTING STARTED WITH ANDROID

(15 Hours)

Android Definition-Android Versions-Features of Android-Architecture of Android – Activities, Fragments and Intents: Understanding Activities – Applying Styles and Themes to an Activity- Hiding the Activity Title- Displaying a Dialogue Window-Intent-Fragments – Android User Interface: Understanding the Components of a screen- Adapting to Display Orientation– Designing User Interface with views – Displaying Pictures and Menus with Views – Data Persistence.

UNIT V INTRODUCTION TO FLUTTER

(15 Hours)

Introducing Flutter – Understanding Widgets Lifecycle Events – Widget tree and Element tree -Learning Dart Basics: Using Dart – variables – Operators – Flow statements – Functions - packages–Classes – Understanding Widget trees.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Internet of Things (IoT) integration with mobile platforms-cloud and edge computing for mobile applications-artificial intelligence in mobile environments.

Total Lecture Hours : 75

COURSE OUTCOME

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

1. Explain the fundamentals, architecture, and emerging technologies involved in mobile computing systems.
2. Analyze GSM architecture, mobility management, authentication, and mobile communication services.
3. Understand GPRS operations, wireless data services, and applications of third-generation mobile networks.
4. Design and develop Android applications using activities, fragments, intents, and user interface components.
5. Develop cross-platform mobile applications using Flutter framework and Dart programming concepts.
6. Evaluate contemporary developments and emerging technologies in mobile computing and mobile application development.

TEXT BOOKS

1. Ashok K Talukder, Hasan Ahmed, Roopa R Yavagal, 2010, "Mobile Computing", 2nd Edition, TataMcGraw Hill Publishing Company Limited, India.
2. Wei Meng Lee, 2012, "Beginning Android 4 Application Development", Wiley India Pvt. Ltd, New Delhi.

REFERENCE BOOKS

1. Pradeep Kotari, 2014, "Android Application Development Black Book", Dream tech Press.
2. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHILearning.
3. Jochen Schiller, 2008, "Mobile Communications", Pearson Education, India.
4. RetoMeir, 2012, "Professional Android 4 Application Development", Wiley India Pvt. Ltd., NewDelhi.

E-RESOURCES

https://books.google.co.in/books/about/Mobile_Computing.html?id=psAgAQAAIAAJ
<https://www.slideshare.net/mobile/ankurkumar983/mobile-computing-part1>
<https://www.google.com/amp/s/www.ncertbooks.guru/mobile-computing-pdf/amp/>
<https://www.javatpoint.com/mobile-computing>

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PS01	PS02	PS03	PS04	PS05	PS06	PS07
C01	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
C02	3	2	2	3	3	3	2	3	3	2	3	2	3	3	3	3	3
C03	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	3
C04	3	2	3	3	3	3	2	3	3	3	3	2	3	3	3	3	2
C05	3	3	3	2	3	3	2	3	3	1	3	3	3	3	3	3	2

S-Strong (3)

M-Medium (2)

L-Low

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE



(AUTONOMOUS)

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(For the candidates admitted in the academic year 2026 – 2027)

PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: I-DCEC-I (B) - ADVANCED DATA STRUCTURES

Ins. Hrs. /Week:5

Course Credit:4

Course Code:P26ITDE11B

COURSE OBJECTIVES

1. To provide knowledge of fundamental data structures and their applications in problem solving.
2. To develop understanding of graph representations, traversals, and sorting techniques.
3. To introduce hashing techniques and efficient data retrieval mechanisms.
4. To enable students to implement tree structures and priority queue operations.
5. To analyze graph algorithms and apply appropriate algorithmic techniques for optimization problems.

UNIT – I INTRODUCTION

(15 Hours)

Arrays – Singly Linked List – Circularly Linked List – Stack – Queues – List Abstract Data Type (ADT) – Iterators – Graphs and Sorting 1- Graphs: Graph ADT – Data Structures for Graphs – Graph Traversals – Directed Acyclic Graphs – Shortest Paths – Minimum Spanning Tree - Sorting: Merge Sort – Quick Sort – Selection Sort.

UNIT – II HASHING

(15 Hours)

General Idea, Hash Function- Separate Chaining-Hash Tables without linked lists: Linear Probing-Quadratic Probing-Double Hashing-Rehashing-Hash Tables in the Standard Library-Universal Hashing-Extendible Hashing.

UNIT – III PRIORITY QUEUES (HEAPS)

(15 Hours)

Model-Simple implementations-Binary Heap: Structure Property-Heap Order Property-Basic Heap Operations: insert-delete-Percolate down-Other Heap Operations.

UNIT – IV TREES

(15 Hours)

AVL: Single Rotation-Double Rotation-B-Trees. Multi-way Search Trees– Trees: Searching for an Element in a Tree-Inserting a New Element in a Tree-Deleting an Element from a Tree. Red-Black Trees – Properties of red-black trees- Rotations-Insertion-Deletion.

UNIT – V GRAPHS ALGORITHMS

(15 Hours)

Elementary Graph Algorithms: Topological sort- Single Source Shortest Path Algorithms: Dijkstra's- Bellman-Ford- All-Pairs Shortest Paths: Floyd-Warshall's Algorithm.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

algorithm optimization techniques-large-scale data processing-graph analytics- parallel and distributed algorithms-applications of data structures in artificial intelligence-and modern developments in computational problem solving.

Total Lecture Hours : 75

COURSE OUTCOME

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

1. Explain and apply fundamental data structures including arrays, linked lists, stacks, queues, graphs, and sorting algorithms.
2. Analyze and implement hashing techniques for efficient storage and retrieval of data.
3. Apply priority queues and heap operations to solve computational problems efficiently.
4. Design and implement tree structures including AVL trees, B-trees, and Red-Black trees for data organization.
5. Analyze and implement graph algorithms for traversal, shortest path, and optimization problems.
6. Evaluate contemporary developments and emerging trends in data structures and algorithm design.

TEXT BOOKS

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 4th Edition, 2014, Pearson.
2. Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, 3rd Edition, 2009, The MIT Press.

REFERENCE BOOKS

1. Ellis Horowitz, Satraj Sahani and Rajasekharam, Fundamentals of Computer Algorithms, 2nd Edition, 2009, University Press Pvt. Ltd.
2. ReemaThareja, S. Rama Sree, Advanced Data Structures, Oxford University Press, 2018.

E-RESOURCES

1. <http://www.coursera.org/learn/advanced-data-structures>
2. <http://ocw.mit.edu/6-851S12> (MITOPENCOURSEWARE, Massachusetts Institute of Technology)
3. <https://nptel.ac.in/courses/106/106/106106133/>
4. <https://www.mooc-list.com/search/node?keys=Advanced+Data+Structures>
5. <http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms>

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PS01	PS02	PS03	PS04	PS05	PS06	PS07
CO1	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	3	3	3	2	3	3	2	3	2	3	3	3	3	3
CO3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	3
CO4	3	2	3	3	3	3	2	3	3	3	3	2	3	3	3	3	2
CO5	3	3	3	2	3	3	2	3	3	1	3	3	3	3	3	3	2
S-Strong (3)				M-Medium (2)				L-Low									

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: I-DCEC-I(C) - PROBLEM SOLVING USING R

Ins. Hrs. /Week:5

Course Credit:4

Course Code:P26ITDE11C

COURSE OBJECTIVES

1. To introduce the fundamentals of R programming and develop skills in handling basic computations and data structures.
2. To provide knowledge of matrices, arrays, and their operations for data analysis and mathematical computation.
3. To develop understanding of handling non-numeric data types and categorical data in R.
4. To enable students to manage complex data structures such as lists and data frames for data processing.
5. To develop skills in data visualization, file handling, and graphical representation using R and its packages.

UNIT - I OVERVIEW OF R

(15 Hours)

History and Overview of R- Basic Features of R-Design of the R System- Installation of R- Console and Editor Panes- Comments- Installing and Loading R Packages- Help Files and Function Documentation- Saving Work and Exiting R- Conventions- R for Basic Math- Arithmetic- Logarithms and Exponentials- E- Notation- Assigning Objects- Vectors- Creating a Vector- Sequences, Repetition, Sorting, and Lengths- Subsetting and Element Extraction- Vector-Oriented Behaviour Practical

UNIT - II MATRICES AND ARRAYS

(15 Hours)

Defining a Matrix – Defining a Matrix- Filling Direction- Row and Column Bindings- Matrix Dimensions- Subsetting- Row, Column, and Diagonal Extractions- Omitting and Overwriting- Matrix Operations and Algebra- Matrix Transpose- Identity Matrix- Matrix Addition and Subtraction- Matrix Multiplication- Matrix Inversion-Multidimensional Arrays- Subsets, Extractions, and Replacements

UNIT - III NON-NUMERIC VALUES

(15 Hours)

Logical Values- Relational Operators- Characters- Creating a String- Concatenation- Escape Sequences- Substrings and Matching- Factors- Identifying Categories- Defining and Ordering Levels- Combining and Cutting

UNIT - IV LISTS AND DATA FRAMES

(15 Hours)

Lists of Objects-Component Access-Naming-Nesting-Data Frames-Adding Data Columns and Combining Data Frames-Logical Record Subsets-Some Special Values-Infinity-NaN-NA-NULL Attributes-Object-Class-Is-Dot Object-Checking Functions-As-Dot Coercion Functions

UNIT - V BASIC PLOTTING

(15 Hours)

Using plot with Coordinate Vectors-Graphical Parameters-Automatic Plot Types- Title and Axis Labels Color-Line and Point Appearances-Plotting Region Limits- Adding Points, Lines, and Text to an Existing Plot-ggplot2 Package-Quick Plot with qplot-Setting Appearance Constants with Geoms-- READING AND WRITING FILES- R-Ready Data Sets- Contributed Data Sets- Reading in External Data Files- Writing Out Data Files and Plots- Ad Hoc Object Read/Write Operations.

UNIT - VI CURRENT CONTOURS (For continuous internal assessment only):

Data science applications-advanced visualization techniques-big data analytics with R-machine learning integration.

Total Lecture Hours : 75

COURSE OUTCOME

After successful completion of this course, students will be able to:

1. Understand and apply the basic syntax, programming concepts, and development environment in R.
2. Perform vector, matrix, and array operations using built-in R functions.
3. Apply logical, character, and factor data types for data analysis and manipulation.
4. Create and manage lists, data frames, and structured datasets in R.
5. Generate data visualizations and graphical representations using plotting functions and the ggplot2 package.
6. Read, write, import, and export datasets for data analysis and reporting using R.

TEXT BOOKS

1. The Book of R: A First Course in Programming and Statistics – 2016.
2. R Programming for Data Science – Lean Publishing, 2016.
3. R for Data Science – O'Reilly Publication, 2017.
4. R Programming for Beginners – CreateSpace Independent Publishing Platform, 2016.
5. Learning R Programming – Packt Publishing, 2016.

REFERENCE BOOKS

1. Hands-On Programming with R – O'Reilly Media.
2. Advanced R – CRC Press.
3. Practical Data Science with R – Manning Publications.
4. The Art of R Programming – No Starch Press.

E-RESOURCES

- [GeeksforGeeks – R Programming Exercises and Practice](#)
- 1. [W3Schools – R Graph Plot Tutorial](#)
- 2. [GeeksforGeeks – List of Data Frames in R](#)
- 3. [CRAN – Comprehensive R Archive Network](#)
- 4. [R Documentation](#)
- 5. [RStudio Official Website](#)

6. COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PS01	PS02	PS03	PS04	PS05	PS06	PS07
C01	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3
C02	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
C03	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
C04	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
C05	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)



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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

Semester: I–DCEP-I(A) – MOBILE COMPUTING LAB

Ins. Hrs. /Week: 2

Course Credit: 2 Course Code:P26ITDE12AP

COURSE OBJECTIVES

1. To understand and implement Android application components including content providers, layouts, views, and event handling.
2. To develop Android applications using files, preferences, notifications, and SQLite databases for data storage and management.
3. To enable students to create mobile applications that access web services and process response data.
4. To provide knowledge of Android services, background threads, and task scheduling mechanisms.
5. To design and develop multimedia, location-based, and simple mobile game applications using Android technologies.

EXERCISE

1. Create an application which deals with Android Content Providers.
2. Create applications using Android Layouts, Views, and Events.
3. Create an application which uses Files, Preferences, and Notifications.
4. Create applications to Create, Modify, and Query an SQLite Database.
5. Create an application for Querying Web Services and Parsing Responses.
6. Create applications which use the concepts of Services and Background Threads.
7. Create Android Audio and Video Applications.
8. Create an application which uses Map Activity and points locations onto Map Locations.
9. Create an application with One-Time Alarms, Repeating Alarms, and Long-Running Background Tasks as Services.
10. Create an application for a Simple Mobile Game.

Total Lecture Hours : 30

COURSE OUTCOME

After successful completion of this course, students will be able to:

1. Develop Android applications using layouts, views, events, and activity management.
2. Implement data storage techniques using files, shared preferences, and SQLite databases.
3. Design applications using content providers, services, notifications, and background threads.
4. Integrate web services and parse responses in Android applications.
5. Develop multimedia and map-based Android applications.
6. Build real-time mobile applications including alarms, services, and simple mobile games.

TEXT BOOKS

1. Professional Android Application Development – Wiley India.
2. Android Programming: The Big Nerd Ranch Guide – Big Nerd Ranch Guides.
3. Beginning Android Application Development – Wiley Publications.
4. Head First Android Development – O'Reilly Media.

REFERENCE BOOKS

1. Android Studio Development Essentials – Techotopia Publications.
2. Android Cookbook – O'Reilly Publications.
3. Mobile Application Development – SK Kataria & Sons.
4. Android Application Development for Java Programmers – Cengage Learning.

E-RESOURCES

- [Android Developers Official Website](#)
- [Android Studio Official Website](#)
- [Kotlin Official Documentation](#)
- [Oracle Java Tutorials](#)
- [GeeksforGeeks Android Tutorial](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PS01	PS02	PS03	PS04	PS05	PS06	PS07
CO1	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	3	3	3	2	3	3	2	3	2	3	3	3	3	3
CO3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	3
CO4	3	2	3	3	3	3	2	3	3	3	3	2	3	3	3	3	2
CO5	3	3	3	2	3	3	2	3	3	1	3	3	3	3	3	3	2

S-Strong (3)

M-Medium (2)

L-Low

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE



(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI - 614016.

(For the candidates admitted in the academic year 2026 – 2027)

PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

Semester: I-DCEP-I(B) – ADVANCED DATA STRUCTURE LAB

Ins. Hrs. /Week: 2

Course Credit: 2

Course Code: P26ITDE12BP

OBJECTIVES:

- To provide practical knowledge in implementing linear and non-linear data structures using programming concepts.
- To develop skills in performing operations on linked lists, stacks, and queues using arrays and linked representations.
- To enable students to implement sorting techniques and analyze their application in data organization.
- To develop the ability to design and implement tree data structures and perform traversal operations.
- To enhance problem-solving skills through the implementation of advanced data structures such as AVL Trees, Splay Trees, and B-Trees.

EXERCISE

1. Develop a program to perform the following operations on doubly linked list.
i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways
2. Develop a program that implements stack and its operations using i) Arrays ii) linked list.
3. Develop a programs that implements Queue and its operations using i) Arrays ii) linked list.
4. Develop a program that implements the Quick sort method to sort a given list of integers in ascending order.
5. Develop a program that implement the Merge sort method to sort a given list of integers in ascending order.
6. Develop a program to perform the following: i) Creating a Binary Tree of integers ii) Traversing the above binary tree in preorder, inorder and postorder.
7. Develop a program to perform the following: i) Creating a AVL Tree of integers ii) Traversing the above binary tree in preorder, inorder and postorder.
8. Develop a program that uses functions to perform the following: i) Creating a SplayTree of integers ii) Traversing the above binary tree in preorder, inorder and postorder.
9. Develop program to perform the following: i) Creating a B-Tree of integers ii) Traversing the above binary tree in preorder, inorder and postorder.

Total Lecture Hours : 30

COURSE OUTCOME

After successful completion of this course, students will be able to:

1. Implement linear and non-linear data structures using suitable programming techniques.
2. Apply stack and queue operations using arrays and linked lists.
3. Design and analyze sorting algorithms such as Quick Sort and Merge Sort.
4. Construct and traverse various tree structures including Binary Tree, AVL Tree, Splay Tree, and B-Tree.
5. Implement graph algorithms such as Kruskal's Algorithm using disjoint set operations.
6. Develop efficient problem-solving skills using advanced data structures and algorithms.

TEXT BOOKS

1. Data Structures Using C – Oxford University Press.
2. Data Structures Through C – BPB Publications.
3. Fundamentals of Data Structures in C – Universities Press.
4. Data Structures and Algorithm Analysis in C – Pearson Education.

REFERENCE BOOKS

1. Classic Data Structures – PHI Learning.
2. Introduction to Algorithms – MIT Press.
3. Problem Solving with C – Schaum's Outline Series.
4. Schaum's Outline of Data Structures – McGraw-Hill.

E-RESOURCES

- [GeeksforGeeks Data Structures Tutorial](#)
- [TutorialsPoint Data Structures Tutorial](#)
- [Programiz Data Structures Tutorial](#)
- [W3Schools Data Structures Tutorial](#)
- [NPTEL Data Structures Courses](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PS01	PS02	PS03	PS04	PS05	PS06	PS07
CO1	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	3	3	3	2	3	3	2	3	2	3	3	3	3	3
CO3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	3
CO4	3	2	3	3	3	3	2	3	3	3	3	2	3	3	3	3	2
CO5	3	3	3	2	3	3	2	3	3	1	3	3	3	3	3	3	2

S-Strong (3)

M-Medium (2)

L-Low

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE



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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: I-DCEP-I(C) - PROBLEM SOLVING USING R LAB

Ins. Hrs. /Week:2

Course Credit:2

Course Code:P26ITDE12CP

COURSE OBJECTIVES

- To develop programming skills in R for performing mathematical computations and vector operations.
- To provide practical knowledge of creating, manipulating, and analyzing vectors, matrices, and multidimensional arrays.
- To enable students to perform data extraction, transformation, and validation using R programming constructs.
- To develop skills in creating and managing data frames and structured datasets in R.
- To provide practical exposure to string handling and data manipulation techniques for data analysis applications.

EXERCISES

1. Develop a program for basic mathematical computation – Square, Square Root, Exponential, etc.
2. Develop a program to extract the first and last elements of an already created vector and store them as a new object.
3. Develop a program to overwrite the existing object using the same sequence with the order reversed.
4. Develop a program to confirm that the length of the created vector is 20.
5. Create and store a three-dimensional array with six layers of a 4×2 matrix, filled with a decreasing sequence of values between 4.8 and 0.1 of appropriate length.
6. Extract and store as a new object the fourth-row and first-row elements, in that order, of the second column only from all layers of the array.
7. Confirm the specific locations of elements equal to 0 in the 10×10 identity matrix (I10).
8. Create and store a data frame as dframe with the fields: person, sex, and funny in the R workspace and append two new records.
9. Use character string handling in R to extract all records from mydataframe corresponding to people whose names start with S.

Total Lecture Hours : 30

COURSE OUTCOME

After successful completion of this course, students will be able to:

1. Apply basic programming concepts and mathematical computations using R.
2. Perform vector, matrix, and multidimensional array operations in R.
3. Manipulate and process character strings and non-numeric data efficiently.
4. Create, modify, and manage data frames and structured datasets.
5. Apply data extraction and transformation techniques for analysis.
6. Generate graphical visualizations and interpret data using plotting tools in R.

TEXT BOOKS

1. The Book of R: A First Course in Programming and Statistics
2. R Programming for Data Science
3. R for Data Science
4. Learning R Programming

REFERENCE BOOKS

1. Hands-On Programming with R
2. Advanced R
3. Practical Data Science with R
4. The Art of R Programming

E-RESOURCES

- [CRAN – Comprehensive R Archive Network](#)
- [R Documentation](#)
- [RStudio Official Website](#)
- [GeeksforGeeks – R Programming Practice](#)
- [W3Schools – R Plot Tutorial](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
	CO1	2	2	3	3	3	2	3	3	3	3	3	3	3	3	3	3	
	CO2	3	2	2	3	3	2	3	3	2	3	2	3	3	3	3	3	
	CO3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	3	
	CO4	3	2	3	3	3	2	3	3	3	3	2	3	3	3	3	2	
	CO5	3	3	3	2	3	3	2	3	3	1	3	3	3	3	3	3	2
	S-Strong (3)					M-Medium (2)					L-Low							

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: I-GEC-I(A) – E-COMMERCE

Ins. Hrs. /Week: 5

Course Credit: 3

Course Code: P26ITGE11A

COURSE OBJECTIVES

1. To introduce the concepts, framework, and applications of electronic commerce and Internet technologies.
2. To provide knowledge of Electronic Data Interchange (EDI), workflow automation, and business communication systems.
3. To understand network security concepts, firewalls, web technologies, and secure electronic communication.
4. To develop understanding of consumer-oriented electronic commerce models and online business processes.
5. To enable students to understand electronic payment systems and their design, implementation, and security aspects.

UNIT – I E-COMMERCE:

(15 Hours)

Framework-Classification of electronic commerce -Anatomy of E-Commerce Applications-Components of the I way-Network Access Equipment-Internet Terminology.

UNIT – II ELECTRONIC DATA INTERCHANGE:

(15 Hours)

Benefits-EDI Legal, Security & privacy issues- EDI software implementation- Value added networks-Internal Information Systems-Work flow automization and Coordination-Customization and Internal Commerce.

UNIT – III NETWORK SECURITY AND FIREWALLS:

(15 Hours)

Client Server Network Security- Emerging client server security threats- Firewalls and network security- Data and message security- Encrypted documents and electronic mail- Hypertext publishing- Technology behind the web- Security and the web.

UNIT – IV CONSUMER ORIENTED ELECTRONIC COMMERCE:

(15 Hours)

Consumer Oriented Applications-Mercantile Process Models-Mercantile Models From the Consumers Perspective- Mercantile Models from the Merchants Perspective.

UNIT – V ELECTRONIC PAYMENT SYSTEMS:

(15 Hours)

Types-Digital Token Based Electronic Payment System-Smart Cards & Credit Card Electronic Payment Systems -Risk -Designing electronic payment system.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Mobile commerce-cloud-based commerce platforms-cybersecurity in e-commerce-blockchain-enabled transactions-artificial intelligence in online business.

Total Lecture Hours : 75

COURSE OUTCOME

After successful completion of this course, students will be able to:

1. Understand Green IT concepts, environmental concerns, sustainability principles, and Green IT strategies.
2. Analyze the life cycle of devices and apply green practices including reuse, recycling, and disposal.
3. Evaluate green software methodologies and energy-efficient computing techniques.
4. Understand the role of Information Technology in developing sustainable and green enterprises.
5. Apply Green IT management strategies and implementation approaches in organizations.
6. Identify laws, standards, protocols, and emerging sustainability trends related to Green IT.

TEXT BOOKS

1. Harnessing Green IT: Principles and Practices – Wiley Publication, ISBN: 9788126539680.
2. The Green Computing Book: Tackling Energy Efficiency at Large Scale – CRC Press, 2014.
3. Green IT Strategies and Applications – CRC Press.

REFERENCE BOOKS

1. Green Computing and Green IT Best Practices – CreateSpace Publications.
2. Sustainable IT Services – IT Governance Publishing.
3. Green Computing Tools and Techniques for Saving Energy Money and Resources – CRC Press.
4. Energy Efficient Computing and Electronics – CRC Press.

E-RESOURCES

1. [JavaTpoint Green Computing Tutorial](#)
2. [ACM Digital Library – Green IT Research](#)
3. [Green Electronics Council](#)
4. [ENERGY STAR Program](#)
5. [The Green Grid](#)
6. [United Nations Sustainable Development Goals](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PS01	PS02	PS03	PS04	PS05	PS06	PS07
CO1	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	3	3	3	2	3	3	2	3	2	3	3	3	3	3
CO3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	3
CO4	3	2	3	3	3	3	2	3	3	3	3	2	3	3	3	3	2
CO5	3	3	3	2	3	3	2	3	3	1	3	3	3	3	3	3	2

S-Strong (3)

M-Medium (2)

L-Low

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: I–GEC-I(B) – ADVANCED SOFTWARE ENGINEERING

Ins. Hrs. /Week: 5

Course Credit: 3

Course Code:P26ITGE11B

COURSE OBJECTIVES

- To understand the principles, methodologies and life cycle models of software engineering.
- To learn software project planning, effort estimation, risk management and project tracking techniques.
- To study requirements engineering, software design and architectural modeling concepts.
- To understand software testing, quality assurance and maintenance processes for reliable software systems.
- To develop practical knowledge for designing and managing efficient software development projects.

UNIT I NEED FOR S/W ENGINEERING

(15 Hours)

About software and S/w engineering – A systems approach – Engineering approach – Members of the development team – Change in S/w engineering. - Modeling the process and Life cycle: The meaning of process – S/w process models– Tools and techniques for projects modeling – Practical process modeling.

UNIT II PLANNING AND MANAGING THE PROCESS

(15 Hours)

Tracking progress -Milestones-Difference between milestone and activity- Work breakdown and Activity Graphs- Activity Graph- Estimating completion- Tools to track progress-Project personnel : Staff roles and characteristics- Work styles- Rational extroverts- Project Organization: Chief programmer team- Egoless Approach-Effort estimation: Facilities Expert Judgement- Delphi Technique- Algorithmic Methods-COCOMO Model- Machine learning methods - Risk management: Risk Management Activities -The project plan-process models and project management.

UNIT III CAPTURING THE REQUIREMENTS

(15 Hours)

The requirement process – Types of Requirements – Characteristics of requirements – Modeling Notations-Prototyping requirements – Requirements Documentation –validation and verification – Measuring requirements – Choosing a requirements specification Techniques.

UNIT IV DESIGNING THE SYSTEM

(15Hours)

Design Introduction - Modeling the Architectures-Decomposition and views – Architectural styles and strategies – Achieving Quality Attributes-Collaborative Design - Architectural Evaluation and Refinement - Documenting software Architectures – Programming standards and procedures – Programming guidelines – Documentation.

UNIT V SOFTWARE TESTING AND MAINTENANCE

(15 Hours)

Testing strategic issues – Test strategies for conventional S/w – Test strategies for object-oriented S/w – Validation testing – System testing – S/w testing. Fundamentals – Black-box and White-box testing – White box testing – Black box testing – McCall's Quality factors – ISO 9126 - QF- S/w engineering – S/w Maintenance.

Cloud-Based Software Engineering- Software Engineering for Artificial Intelligence Applications- Software Metrics and Project Analytics- Case Studies on Real-World Software Engineering Projects.

Total Lecture Hours-75

On the successful completion of the course, students will be able

1. Describe software engineering layered technology and Process frame work
2. Analyze the role of project management including planning, scheduling, risk management, etc.
3. Analyze implementation issues such as modularity and coding standards.
4. Understand of approaches to verification and validation including static analysis, and reviews.
5. Understand of software testing approaches such as unit testing and integration testing.
- 6..Design reliable and efficient software systems using modern software engineering practices and tools.

1. Roger S. Pressman, "Software Engineering A Practitioner's Approach", 6th Edition, Tata Mc Graw Hill Publication, New Delhi, India.
2. Shari Lawrence P. Fleeger, 2001, "Software Engineering Theory and Practice", 2nd Edition. Pearson Education, Delhi.

1. Douglas Bell, “Software Engineering for Students-A Programming Approach”, 4th Edition, Pearson Education, Delhi, 2007.
2. Ian Sommerville, “Software Engineering”, 6th Edition, Pearson Education, Delhi, 2005.
3. Rajib Mall, “Fundamentals of Software Engineering”, 5th Edition, PHilearning, Delhi.

1. https://books.google.com/books/about/Software_Engineering.html?id=fadQAAAAAMAAI
2. <https://shorturl.at/guBF9>
3. <https://www.tutorialspoint.com/sdlc/index.html>

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	3	2	2	2	2	2	2	2	2	3	2	2	3	3	2	2
CO2	3	3	2	3	2	2	2	2	2	2	3	3	2	3	3	2	3
CO3	3	3	2	2	2	2	2	2	2	2	3	3	2	3	3	2	2
CO4	2	2	3	3	2	2	2	2	2	2	3	2	2	2	2	3	3
CO5	2	2	3	3	2	2	2	2	2	2	3	3	2	2	2	3	3

L-Low (1)

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE



(AUTONOMOUS)

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(For the candidates admitted in the academic year 2026 – 2027)

PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: I-GEC-I(C) – GREEN COMPUTING

Ins. Hrs. /Week: 5

Course Credit: 3

Course Code:P26ITGE11C

COURSE OBJECTIVES:

1. To introduce the concepts of Green IT and understand the environmental impact of information technology.
2. To develop knowledge of green devices, sustainable hardware practices, and energy-efficient software techniques.
3. To understand the role of information systems and IT in promoting sustainable enterprise practices.
4. To provide knowledge of planning, implementing, and managing Green IT initiatives within organizations.
5. To understand laws, standards, regulations, and sustainable practices related to Green IT and environmental responsibility.

UNIT – I GREEN IT: AN OVERVIEWS

(15 Hours)

Introduction, Environmental Concerns and Sustainable Development, Environmental Impacts of IT, Green IT, Holistic Approach to Greening IT, Greening IT, Applying IT for enhancing Environmental sustainability, Green IT Standards and Eco-Labeling of IT, Enterprise Green IT strategy, Green IT: Burden or Opportunity

UNIT – II GREEN DEVICES AND HARDWARE WITH GREEN SOFTWARE (15 Hours)

Green Devices and Hardware: Introduction, Life Cycle of a device or hardware, Reuse, Recycle and Dispose. Green Software: Introduction, Energy-saving software techniques, Evaluating and Measuring software Impact to platform power.

UNIT – III GREEN ENTERPRISES AND THE ROLE OF IT

(15 Hours)

Introduction, Organization and Enterprise Greening, Information systems in Greening Enterprises, Greening Enterprise: IT Usage and Hardware, Inter- Organizational Enterprise activities and Green Issues, Enablers and making the case for IT and Green Enterprise.

UNIT – IV MANAGING GREEN IT

(15 Hours)

Introduction, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication and Social media.

UNIT – V REGULATING THE GREEN IT

(15 Hours)

Laws, Standards and Protocols Introduction, The regulatory environment and IT manufacturers, Non regulatory government initiatives, Industry associations and standards bodies, Green building standards, Green data centers, Social movements and Greenpeace.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Energy-efficient technologies, green data centers, carbon footprint reduction through IT, cloud sustainability, environmental regulations, circular economy practices in IT, and emerging technologies supporting environmental sustainability.

Total Lecture Hours-75

COURSE OUTCOME

After successful completion of this course, students will be able to:

1. Understand Green IT concepts, environmental concerns, sustainability principles, and Green IT strategies.
2. Analyze the life cycle of devices and apply green practices including reuse, recycling, and disposal.
3. Evaluate green software methodologies and energy-efficient computing techniques.
4. Understand the role of Information Technology in developing sustainable and green enterprises.
5. Apply Green IT management strategies and implementation approaches in organizations.
6. Identify laws, standards, protocols, and emerging sustainability trends related to Green IT.

TEXT BOOKS

1. Harnessing Green IT: Principles and Practices – Wiley Publication, ISBN: 9788126539680.
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3. Green IT Strategies and Applications – CRC Press.

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2. Sustainable IT Services – IT Governance Publishing.
3. Green Computing Tools and Techniques for Saving Energy Money and Resources – CRC Press.
4. Energy Efficient Computing and Electronics – CRC Press.

E-RESOURCES

1. [JavaTpoint Green Computing Tutorial](#)
2. [ACM Digital Library – Green IT Research](#)
3. [Green Electronics Council](#)
4. [ENERGY STAR Program](#)
5. [The Green Grid](#)
6. [United Nations Sustainable Development Goals](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	3	3	3	2	3	3	2	3	2	3	3	3	3	3
CO3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	3
CO4	3	2	3	3	3	3	2	3	3	3	3	2	3	3	3	3	2
CO5	3	3	3	2	3	3	2	3	3	1	3	3	3	3	3	3	2

S-Strong (3)

M-Medium (2)

L-Low

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE



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(For the candidates admitted in the academic year 2026 – 2027)

**PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE
M.Sc., INFORMATION TECHNOLOGY**

SEMESTER: I– SEC-I – REACT JS

Ins. Hrs. /Week: 2

Course Credit: 2

Course Code:P26SEIT11

COURSE OBJECTIVES

- To understand the fundamentals of JavaScript and React for modern web development.
- To learn DOM manipulation, form validation and event handling using JavaScript.
- To develop reusable and interactive user interface components using React and JSX.
- To understand state management, props and component-based application development in React.
- To build responsive and dynamic front-end web applications using modern JavaScript frameworks and tools.

UNIT I JAVASCRIPT ESSENTIALS

(6 Hours)

Introduction to JavaScript- Variables, Control statements- Array-Functions- popup boxes.

UNIT II JAVASCRIPT DOM & FORMS

(6 Hours)

Document Object Model-getElementById-innerHTML-Basic form validations.

Unit III REACT BASICS & JSX

(6 Hours)

What is React-Why React- React project setup-JSX- Expressions- Attributes- Fragments.

UNIT IV COMPONENTS, STATE & PROPS

(6 Hours)

Functional components-Class components-Component composition-State with useState, Passing data with props- defaultProps.

UNIT V LISTS, EVENTS & FORMS

(6 Hours)

Rendering lists with map-key prop- Event handling-Synthetic events-Basic forms in React.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only Self Study):

Introduction to Single Page Applications- API Integration using Fetch and Axios- Case Studies on Modern Web Applications using React.

Total Lecture Hours-30

COURSE OUTCOME

On the successful completion of the course, students will be able

1. Understanding JavaScript Basics and DOM Manipulation.
2. Implementing JavaScript Features for User Interaction
3. Exploring and Using React for UI Development
4. Developing React Components and Managing State
5. Managing Events and Dynamic Data in React
6. Analyze component-based architecture and modern front-end development practices.

TEXT BOOKS

1. Vipul A M, Prathamesh Sonpatki, "ReactJS by Example - Building Modern Web Applications with React", Packt Publishing, 2016.
2. Emma William, "React Js for Beginners A Comprehensive Beginner's Guide to ReactJS", 2021.
3. Thomas A Powell "HTML & CSS, the complete reference, fifth edition", McGraw Hill LLC, 2010.

REFERENCE BOOKS

1. Adam Boduch, Roy Derks, "React and React Native A Complete Hands-on Guide to Modern Web and Mobile Development", Packt Publishing, 2020.
2. Lionel Lopez, "Quickstart Step-By-Step Guide to Learning React Javascript Library", Createspace Independent Publisher, 2017.

E-RESOURCES

1. <http://React.js>

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
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CO2	2	3	2	3	2	3	2	3	2	2	3	2	3	2	3	3	2
CO3	3	2	3	2	3	2	3	3	3	3	3	3	3	3	3	2	3
CO4	2	3	2	3	2	3	2	3	3	2	3	2	2	2	3	3	2
CO5	3	2	3	2	3	3	3	2	2	3	2	3	3	3	2	2	3

S-Strong (3)

M-Medium (2)

L-Low (1)

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: I - VAC - I: ADVANCED AI APPLICATIONS IN COMPUTER SCIENCE

Ins. Hrs. / Week: 2

Course Credit: 2

Course Code: P26ITVA11

COURSE OBJECTIVES

- To understand advanced concepts and architectures in Artificial Intelligence.
- To explore machine learning, deep learning, and neural network techniques for real-world applications.
- To develop intelligent systems using Natural Language Processing and Computer Vision.
- To analyze AI applications in cybersecurity, cloud computing, IoT, and data analytics.
- To enhance practical skills through AI-based projects, case studies, and research activities.

UNIT – I : FOUNDATIONS OF ADVANCED ARTIFICIAL INTELLIGENCE

Introduction to Advanced AI – Evolution of AI – Intelligent Agents – Knowledge Representation – Search Techniques – Expert Systems – Fuzzy Logic – Evolutionary Computing – AI Architectures – Ethical Issues and Responsible AI – AI Development Platforms and Tools.

UNIT – II : MACHINE LEARNING AND DEEP LEARNING

Supervised Learning – Unsupervised Learning – Reinforcement Learning – Classification and Regression – Clustering Algorithms – Artificial Neural Networks – Deep Neural Networks – Convolutional Neural Networks (CNN) – Recurrent Neural Networks (RNN) – Transfer Learning – Model Evaluation Techniques.

UNIT – III : NATURAL LANGUAGE PROCESSING AND GENERATIVE AI

Introduction to NLP – Text Processing – Tokenization – Sentiment Analysis – Chatbots and Virtual Assistants – Large Language Models – Prompt Engineering – Generative AI Concepts – AI-based Content Generation – Speech Recognition – Machine Translation – Ethical Challenges in Generative AI.

UNIT – IV : COMPUTER VISION AND INTELLIGENT SYSTEMS

Image Processing Fundamentals – Feature Extraction – Object Detection – Face Recognition – Video Analytics – AI in Robotics – Autonomous Systems – Smart Surveillance – Medical Image Analysis – AI for Augmented and Virtual Reality – Edge **AI Applications.**

UNIT – V : AI APPLICATIONS IN EMERGING TECHNOLOGIES

AI in Cybersecurity – AI for Cloud Computing – AI in Internet of Things (IoT) – Predictive Analytics – AI in Healthcare – AI in Finance and Business Intelligence – Smart Cities – Industrial Automation – AI in Scientific Research – Future Trends in Artificial Intelligence.

UNIT – VI : CIA COMPONENTS (CONTINUOUS INTERNAL ASSESSMENT)CIA ACTIVITIES

Assignment on Machine Learning Algorithms - Seminar Presentation on Generative AI Applications - Mini Project using AI Tools or Frameworks -Case Study Analysis on AI-based Solutions -Model Development and Practical Demonstration - Online Quiz / Objective Test / Viva Voce.

Total Lecture Hours-30

COURSE OUTCOME

On the successful completion of the course, students will be able

1. Explain advanced AI concepts, architectures, and intelligent systems.
2. Apply machine learning and deep learning techniques for problem solving.
3. Develop NLP and Generative AI based applications.
4. Design computer vision and intelligent automation solutions.
5. Analyze AI applications in cybersecurity, healthcare, IoT, and cloud environments.
6. Create AI-based projects and evaluate ethical and societal impacts of AI technologies.

Text Books

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 4th Edition, Pearson Education, 2021.
2. Deep Learning, Ian Goodfellow, Yoshua Bengio and Aaron Courville, *Deep Learning*, MIT Press, 2016.
3. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, Aurélien Géron, *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*, 3rd Edition, O'Reilly Media, 2022.

Reference Books

1. Machine Learning, Tom M. Mitchell, *Machine Learning*, McGraw-Hill Education, 2017.
2. Natural Language Processing with Python, Steven Bird, Ewan Klein and Edward Loper, *Natural Language Processing with Python*, O'Reilly Media, 2009.
3. Python Machine Learning, Sebastian Raschka and Vahid Mirjalili, *Python Machine Learning*, 3rd Edition, Packt Publishing, 2019.
4. Computer Vision: Algorithms and Applications, Richard Szeliski, *Computer Vision: Algorithms and Applications*, Springer, 2022.

E-Resources

1. Coursera – Artificial Intelligence Courses
2. [edX – AI and Machine Learning Programs](#)
3. [TensorFlow Documentation](#)
4. [OpenAI Documentation](#)
5. [Google AI Resources](#)

SEMESTER II

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE



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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: II-CC-III – ADVANCED DATABASE MANAGEMENT SYSTEMS

Ins. Hrs. /Week: 6

Course Credit: 4

Course Code:P26IT204

COURSE OBJECTIVES

- To understand advanced database design concepts and normalization techniques.
- To study parallel and distributed database architectures and query processing methods.
- To explore object-oriented, spatial, temporal, XML, and multimedia database systems.
- To gain knowledge of emerging database technologies and their real-world applications.
- To develop the ability to analyze and design modern database applications efficiently.

UNIT – I RELATIONAL AND PARALLEL DATABASE DESIGN: (18 Hours)

Basics, Entity Types, Relationship Types, ER Model, ER-to-Relational Mapping algorithm. Normalization: Functional Dependency, 1NF, 2NF, 3NF, BCNF, 4NF and 5NF. Architecture, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism.

UNIT – II DISTRIBUTED AND OBJECT BASED DATABASES: (18 Hours)

Architecture, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control, Query Processing. Complex Data Types, Structured Types and Inheritance, Table Inheritance, array and Multiset, Object Identity and Reference Types, Object Oriented versus Object Relational.

UNIT – III SPATIAL DATABASE: (18 Hours)

Spatial Database Characteristics, Spatial Data Model, Spatial Database Queries, Techniques of Spatial Database Query, Logic based Databases: Introduction, Overview, Propositional Calculus, Predicate Calculus, Deductive Database Systems, Recursive Query Processing

UNIT – IV XML DATABASES: (18 Hours)

XML Hierarchical data model, XML Documents, DTD, XML Schema, XML Querying, XHTML, Illustrative Experiments

UNIT – V TEMPORAL DATABASES: (18 Hours)

Introduction, Intervals, Packing and Unpacking Relations, Generalizing the relational Operators, Database Design, Integrity Constraints, Multimedia Databases: Multimedia Sources, Multimedia Database Queries, Multimedia Database Applications.

UNIT – VI: CURRENT CONTOURS (For continuous internal assessment only Self Study):

Cloud Database Management Systems- Graph Databases and Knowledge Representation- Case Studies on Multimedia, Spatial and Temporal Database Applications.

Total Lecture Hours:90

COURSE OUTCOME

After successful completion of this course, students will be able to:

1. Design relational databases using ER modeling, normalization techniques, and parallel database concepts.
2. Analyze distributed and object-based database architectures for efficient data management.
3. Apply spatial and logic-based database concepts for advanced query processing.
4. Design and query XML databases using XML schema and hierarchical data models.
5. Understand temporal and multimedia databases for handling time-dependent and multimedia information.
6. Evaluate emerging trends and standards in modern database technologies.

TEXT BOOKS

1. Database System Concepts – 6th Edition, McGraw-Hill International Edition, 2011.
2. An Introduction to Database Systems – 8th Edition, Pearson Education Reprint, 2016.
3. Fundamentals of Database Systems – 7th Edition, Pearson, 2016.
4. Database Systems: A Practical Approach to Design Implementation and Management – Pearson Education, 2014.

REFERENCE BOOKS

1. Distributed Database Systems – Springer.
2. Database Management Systems – McGraw-Hill.
3. Principles of Database and Knowledge Base Systems – Computer Science Press.
4. Fundamentals of Database Technology – Pearson Education.

E-RESOURCES

- [GeeksforGeeks – Normal Forms in DBMS](#)
- [Simplilearn – SQL Normalization Tutorial](#)
- [TutorialsPoint – Spatial Databases](#)
- [Oracle Spatial Database Documentation](#)
- [NPTEL – Database Management Systems](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PS01	PS02	PS03	PS04	PS05	PS06	PS07
	CO1	3	2	3	2	3	3	2	3	3	3	3	2	3	2	3	3
	CO2	3	3	2	3	2	2	3	3	2	3	3	3	3	2	3	3
	CO3	3	3	3	3	3	2	2	3	2	3	3	2	3	3	3	3
	CO4	2	3	2	3	3	3	3	3	2	2	3	3	2	3	2	3
	CO5	3	2	3	3	3	3	3	2	3	3	2	3	3	3	3	2
S-Strong (3)			M-Medium (2)			L-Low (1)											

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: II-CC-IV - CRYPTOGRAPHY AND NETWORK SECURITY

Ins. Hrs. /Week:6

Course Credit:4

Course Code:P26IT205

COURSE OBJECTIVES

- To understand the fundamentals of network security architecture, security attacks, services and mechanisms.
- To learn classical and modern cryptographic techniques including symmetric key, public key and hash-based encryption methods.
- To study transport layer security protocols such as SSL, TLS, HTTPS and SSH for secure communication.
- To understand wireless network security mechanisms, mobile security strategies and IP security protocols.
- To develop knowledge on system security concepts including intrusion detection, malware analysis, firewalls and cyber security countermeasures.

UNIT-I COMPUTER AND NETWORK SECURITY CONCEPTS (18 Hours)

Introduction: The OSI Security Architecture-Security attacks-Security Services-Security mechanisms - A model for network Security - **Classical Encryption Techniques:** Symmetric Cipher model: Cryptography – Cryptanalysis and Brute-Force Attack. **Substitution Techniques:** Caesar Cipher – Monoalphabetic Ciphers – Playfair Cipher – Hill Cipher – Polyalphabetic Ciphers – One Time Pad. Transposition Techniques–Rotor Machines– Steganography.

UNIT- II BLOCK CIPHERS AND DATA ENCRYPTION STANDARDS (18 Hours)

Traditional Block Cipher Structure-Stream Ciphers and block Ciphers –Motivation for the Feistel Cipher Structure – The Fiestel Cipher- **The Data Encryption Standard:** DES Encryption – DES Decryption. **The Strength of DES:** The use of 56-Bit Keys – The Nature of the DES Algorithm Timing Attacks. **Block Cipher Design Principles:** Number of Rounds – Design of function F Key Schedule Algorithm. **Public-Key Cryptography and RSA:** Public Key Cryptosystems- Applications for Public-Key Cryptosystems Requirements for public-Key Cryptography–Public Key Cryptanalysis-The RSA Algorithm. **Cryptographic Hash Functions:** Applications of Cryptographic Hash Functions –SHA-3.

UNIT- III TRANSPORT LEVEL SECURITY (18 Hours)

Web Security Considerations- Web Security Threats- Web Traffic Security Approaches. **Secure Socket Layer :** SSL Architecture – SSL Record Protocol – Change Cipher Spec Protocol – Alert Protocol – Handshake Protocol- Cryptographic Computations. **Transport Layer Security:** Version Number- Message Authentication Code – Pseudorandom Function –Alert Codes – Cipher Suites – Client Certificate types – Certificate-Verify and Finished Messages – Cryptographic Computations-Padding. HTTPS – Secure Shell(SSH) - secure electronic transaction (SET).

UNIT-IV WIRELESS NETWORK SECURITY

(18 Hours)

Wireless Security - Wireless Network Threats – Wireless Security Measures. **Mobile Device Security:** Security Threats – **Mobile Device Security Strategy. IEEE 802.11. Wireless LAN Overview:** The Wi-Fi Alliance – IEEE 802 Protocol Architecture – IEEE 802.11 Network Components and Architectural Model – IEEE 802.11 Services. **IEEE 802.11i Wireless LAN Security:** IEEE 802.11i Services – IEEE 802.11i Phases of Operations – Discovery Phase – Authentication Phase – Key Management Phase – Protected data Transfer Phase – The IEEE Pseudo random Function. **IP Security:** Overview-IP Security policy – Encapsulating Security Payload – Combining Security Associations – Internet Key Exchange

UNIT- V SYSTEM SECURITY

(16 Hours)

System Security: Intruders-Intrusion Detection-Password Management- Malicious Software: Types of Malicious Software(Malware)-Advanced Persistent Threat-Viruses-Worms-Spam E-mail, Trojans- System Corruption-Zombie, Bots - Information Theft - Keyloggers, Phishing, Spyware- Countermeasures-Distributed Denial of Service attacks-Firewalls: The Need for Firewalls-Firewall characteristics and Access Policy- Types of Firewalls-Firewall basing-Firewall Location and Configurations.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only-self study):

Modern cryptography algorithms-Comparision of encryption and decryption standards.

Total Lecture Hours-90

COURSE OUTCOME

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

1. Understand the concepts, methods of Network Security using cryptography basics.
2. Analyze and design classical encryption techniques and block ciphers.
3. Acquire knowledge about Public Key cryptography.
4. Evaluate Hash Functions in network security.
5. Analyze about IP security, Wireless Network security.
6. Analyze the working mechanisms of symmetric and asymmetric cryptographic algorithms.

TEXT BOOKS

- 1.Behrouz A. Ferouzan, 2015, “Cryptography & Network Security”, Tata Mc Graw Hill, India.
- 2.William Stallings,2016, “Cryptography and Network Security”-Principles and Practices, Prentice-Hall, Seventh edition, **ISBN:10:1-292-15858-1**, India.

REFERENCE BOOKS

1. Johannes A. Buchaman, “Introduction to cryptography” (2nd edition), 2004. ISBN0387207562, Springer Publications, United States, 2004.
2. Robert Collins, “Network Security Monitoring: Basics for Beginners”, 2017.
3. William Stallings, “Cryptography and Network Security”-Principles and Practices, Prentice-Hall, Seventh edition, ISBN:10:1-292-15858-1, India, 2017.
- 4.Neal Krawetz, “Introduction to Network Security”, Charles River media Publications, 2007.

E_RESOURCES

1. https://www.vssut.ac.in/lecture_notes/lecture1428550736.pdf
2. <https://annauniversityedu.blogspot.com/2020/08/cryptography-and-network-security-notes-AU.html>
3. <http://surya.ac.in/wp-content/uploads/2020/09/Unit-1-5-CS8792-CNS-Notes.pdf>

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PS01	PS02	PS03	PS04	PS05	PS06	PS07
C01	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3
C02	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
C03	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
C04	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
C05	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3
S-Strong (3)							M-Medium (2)					L-Low (1)					



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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: II-CP-II -ADVANCED DATABASE MANAGEMENT SYSTEMS LAB

Ins. Hrs. /Week:4

Course Credit:4

Course Code:P26IT206P

COURSE OBJECTIVES

- To understand the architecture and design principles of multiprocessor, distributed, database and mobile operating systems.
- To study process synchronization, scheduling, memory management and distributed communication techniques in operating systems.
- To learn distributed file systems, shared memory concepts and concurrency control algorithms used in advanced operating systems.
- To understand mobile operating system architectures, kernel structures and power management approaches.
- To develop analytical skills for designing and managing modern operating system environments in distributed and mobile computing systems.

EXERCISE

1. Usage of Data Definition Language (DDL) Commands.
2. Usage of Data Manipulation Language (DML).
3. Data communication using SQL Functions.
4. Database Design and Normalization.
5. Usage of Join Commands.
6. Implementing Sub Queries.
7. Creating Views.
8. Creating and Executing Triggers.
9. Creating and Executing Procedures.
10. Apply PL/SQL for Processing Databases.

Total Lecture Hours-60

COURSE OUTCOME

After successful completion of this course, students will be able to:

1. Apply SQL commands for database creation, modification, and management.
2. Design relational databases using normalization techniques.
3. Implement data retrieval and manipulation using SQL functions and queries.
4. Develop advanced SQL concepts including joins, subqueries, and views.
5. Create database automation using triggers and procedures.
6. Develop PL/SQL programs to process and manage database operations efficiently.

TEXT BOOKS

1. Database System Concepts – McGraw-Hill.
2. Fundamentals of Database Systems – Pearson Education.
3. SQL PL/SQL The Programming Language of Oracle – BPB Publications.
4. An Introduction to Database Systems – Pearson Education.

REFERENCE BOOKS

1. Database Management Systems – McGraw-Hill.
2. Oracle Database PL/SQL Language Reference.
3. Database Systems A Practical Approach to Design Implementation and Management – Pearson.
4. Learning SQL – O'Reilly Media.

E-RESOURCES

1. [Oracle SQL Documentation](#)
2. [MySQL Documentation](#)
3. [W3Schools SQL Tutorial](#)
4. [GeeksforGeeks DBMS Tutorial](#)
5. [TutorialsPoint SQL Tutorial](#)
6. [NPTEL Database Management Systems](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
C01	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3
C02	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
C03	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
C04	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
C05	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: II-DCEC-II(A) - DATA MINING TECHNIQUES AND TOOLS

Ins. Hrs. /Week:4

Course Credit:4

Course Code:P26ITDE23A

COURSE OBJECTIVES:

1. To introduce the fundamental concepts, functionalities, and applications of data mining techniques.
2. To develop knowledge of data preprocessing methods for preparing data for mining and analysis.
3. To understand classification and prediction techniques used in extracting meaningful patterns from data.
4. To provide knowledge of clustering methods and data visualization techniques for analytical decision-making.
5. To enable students to understand advanced data mining techniques and their applications in diverse domains.

UNIT – I INTRODUCTION TO DATA MINING:

(12 Hours)

Mining from database - Data mining functionalities – Mining patterns - Classification of data mining systems - Major issues in Data mining.

UNIT – II DATA PREPROCESSING:

Need for preprocessing – Data summarization – Data cleaning – Data integration - Data transformation – Data reduction – Data discretization. Association Rule Mining: Apriori algorithm.

UNIT – III CLASSIFICATION:

(12 Hours)

Decision trees - Naïve Bayes - K Nearest Neighbour - Support Vector Machine - Neural Networks- Deep Neural Networks- Evaluation of classification algorithms. Prediction – Regression, Evaluation of Prediction methods.

UNIT – IV CLUSTERING:

(12 Hours)

Cluster Analysis - Partitioning Methods: K-Means, K-Medoids - Hierarchical Methods – BIRCH, ROCK - Density based methods: DBSCAN, OPTICS - Evaluation of clustering algorithms. Data Visualization: Foundations for building visualizations - Visualizing data -Working with Data in Tableau - Moving from Foundational to Advanced Visualizations.

UNIT – V ADVANCED DATA MINING TECHNIQUES:

(12 Hours)

Mining Data Streams - Mining Time Series Data - Mining Sequence Patterns in Biological Data - Graph Mining - Social Network Analysis – Spatial Data Mining - Multimedia Data Mining - Text Mining - Mining the World Wide Web - Data Mining Applications and Tools.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Artificial intelligence and machine learning integration- deep learning applications- real-time data mining- cloud-based analytics-social media analytics. **Total Lecture Hours-60**

COURSE OUTCOME

After successful completion of this course, students will be able to:

1. Understand fundamental concepts of data mining, data preprocessing, and pattern discovery techniques.
2. Apply classification, prediction, and association rule mining algorithms to analyze datasets.
3. Perform clustering and data visualization using modern visualization tools.
4. Design and implement data mining models for solving real-world analytical problems.
5. Develop predictive and intelligent systems using advanced data mining techniques.
6. Evaluate and apply data mining tools and methodologies across different application domains.

TEXT BOOKS

1. Data Mining: Concepts and Techniques – 2nd Edition, Morgan Kaufmann Publishers.
2. Learning Tableau – PACKT Publishing, 2015.
3. Data Mining: Practical Machine Learning Tools and Techniques – 4th Edition, Morgan Kaufmann Publishers.
4. Principles of Data Mining – Prentice Hall of India.
5. Data Mining Techniques – Universities Press.
6. Data Mining: From Theory to Practice – PHI Learning Pvt. Ltd.
7. Introduction to Data Mining – P.R. Publishers and Distributors.

REFERENCE BOOKS

1. Introduction to Data Mining – Pearson.
2. Machine Learning – McGraw-Hill.
3. Pattern Recognition and Machine Learning – Springer.
4. Mining of Massive Datasets – Cambridge University Press.

E-RESOURCES

1. [JavaTpoint Data Mining Tutorial](#)
2. [TutorialsRide Data Mining Tutorial](#)
3. [JavaTpoint Classification Algorithms in Machine Learning](#)
4. [Google Developers – Clustering in Machine Learning](#)
5. [Tableau Learning Resources](#)
6. [NPTEL Courses](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PS01	PS02	PS03	PS04	PS05	PS06	PS07
C01	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3
C02	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
C03	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
C04	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
C05	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

Semester: II-DCEC-II(B) - DIGITAL WATERMARKING AND STEGANOGRAPHY

Ins. Hrs. /Week:4

Course Credit:4

Course Code:P26ITDE23B

COURSE OBJECTIVES

1. To introduce the concepts of information hiding, digital watermarking, and their applications in multimedia security.
2. To develop understanding of digital watermarking techniques and transform-based approaches for securing digital content.
3. To provide knowledge of steganography concepts, methods, and techniques for secure information transmission.
4. To understand security mechanisms, detection methods, and prevention techniques used in steganography systems.
5. To enable students to analyze advanced applications of watermarking and information hiding in modern security environments.

UNIT – I: INTRODUCTION TO DIGITAL WATERMARKING

(12 Hours)

Introduction – Information Hiding – Digital Watermarking Concepts – Watermarking System – Requirements and Properties of Watermarking – Types of Watermarks – Watermarking Applications – Visible and Invisible Watermarking – Robustness and Security.

UNIT – II: DIGITAL WATERMARKING TECHNIQUES

(12 Hours)

Spatial Domain Watermarking – Frequency Domain Watermarking – Transform Techniques – Discrete Cosine Transform (DCT) – Discrete Wavelet Transform (DWT) – Discrete Fourier Transform (DFT) – Image Watermarking Techniques – Audio and Video Watermarking.

UNIT – III: INTRODUCTION TO STEGANOGRAPHY

(12 Hours)

Concept of Steganography – History – Steganographic System – Characteristics – Types of Steganography – Text Steganography – Image Steganography – Audio Steganography – Video Steganography – Network Steganography.

UNIT – IV: STEGANOGRAPHY METHODS AND SECURITY

(12 Hours)

Spatial Domain Techniques – Transform Domain Techniques – Least Significant Bit (LSB) Method – Masking and Filtering – Encryption and Compression – Steganalysis – Detection and Prevention Techniques – Security Issues.

UNIT – V: APPLICATIONS AND ADVANCED TOPICS

(12 Hours)

Copyright Protection – Authentication – Digital Rights Management – Medical and Military Applications – Biometrics and Watermarking – Cloud Security – Multimedia Security – Emerging Trends in Information Hiding.

UNIT – VI: CURRENT CONTOURS (For Continuous Internal Assessment Only)

Artificial intelligence for information hiding-blockchain-enabled copyright protection-cloud security mechanisms-deep learning approaches for watermarking and steganalysis.

Total Lecture Hours-60

COURSE OUTCOME

After successful completion of this course, students will be able to:

1. Understand the fundamental concepts, principles, and applications of Digital Watermarking and Steganography.
2. Differentiate various watermarking and steganography techniques based on security, robustness, and application requirements.
3. Apply spatial and transform domain techniques for hiding and protecting digital information.
4. Analyze methods for embedding, extracting, and detecting hidden information in multimedia data.
5. Design secure multimedia communication systems using watermarking and steganographic approaches.
6. Evaluate information hiding techniques for copyright protection, authentication, and digital security applications.

TEXT BOOKS

1. Digital Watermarking and Steganography – Morgan Kaufmann Publishers.
2. Information Hiding: Steganography and Watermarking Attacks and Countermeasures – Springer.
3. Multimedia Security: Steganography and Digital Watermarking Techniques for Protection of Intellectual Property – CRC Press.

REFERENCE BOOKS

1. Digital Watermarking – CRC Press.
2. Data Hiding Fundamentals and Applications – Elsevier.
3. Computer and Information Security Handbook – Morgan Kaufmann.

E-RESOURCES

- [TutorialsPoint – Steganography Tutorial](#)
- [GeeksforGeeks – Digital Watermarking](#)
- [NPTEL Courses](#)
- [MIT OpenCourseWare](#)
- [IEEE Xplore Digital Library](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PS01	PS02	PS03	PS04	PS05	PS06	PS07
CO1	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)



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(For the candidates admitted in the academic year 2026 – 2027)

PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: II-DCEC-III (C) -WEB PROGRAMMING

Ins. Hrs. /Week: 4

Course Credit: 4

Course Code: P26ITDE23C

COURSE OBJECTIVES

- To understand the fundamentals of CSS, JavaScript and dynamic web technologies for web application development.
- To learn styling techniques, DOM manipulation and event handling using CSS, JavaScript and jQuery.
- To develop dynamic and interactive web applications using PHP, MySQL and Ajax.
- To understand Angular framework concepts including components, data binding and services.
- To build responsive and modern web applications using front-end and back-end web technologies.

UNIT – I INTRODUCTION TO CSS

(12 Hours)

Importing style sheet- CSS Rules – Style Types – CSS Selectors –Fonts and Typography – Managing Text styles – color- positioning elements – Box model and Layout – Advanced CSS and CSS3: Attribute Selectors – Box -sizing Property – CSS3 Backgrounds – Borders- Multicolumn Layout – Text effects

UNIT – II ACCESSING CSS FROM JAVASCRIPT

(12 Hours)

Revisiting the getElement By Id function – Accessing CSS properties from JavaScript – Inline Javascript – Adding NEW elements – Using Interrupts – Introduction to jQuery: selectors- Handling events – Event functions and Properties -Special effects – Manipulating the DOM – Dynamically Applying classes – Modifying Dimensions – DOM Traversal - Using jQuery without selectors

UNIT – III INTRODUCTION TO DYNAMIC WEB CONTENT

(12 Hours)

HTTP and HTML- The Request /Response Procedure – Benefits of PHP. My SQL, Javascript, CSS and HTML5- Introduction to PHP- Expressions and Control Flow in PHP – PHP Functions and Objects- Arrays – File Handling

UNIT – IV ACCESSING MYSQL USING PHP

(12 Hours)

Form Handling – Cookies, Sessions, and Authentication – Exploring JavaScript - Functions – Objects – Arrays-JavaScript and PHP validation and Error Handling: Validating User Input with JavaScript-Using Ajax

UNIT – V LEARNING ANGULAR

(12 Hours)

Jumping into typescript – Angular components - Expressions – Data binding – Advanced Angular: Events and Change detection – Implementing Angular services in Web applications.

Total Lecture Hours : 60

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

1. Understand the concepts of dynamic web design
2. Apply the concepts of data driven web design using PHP with MySQL
3. Analyze the usage of SQL language, JavaScript, jQuery, PHP and CSS for real time applications
4. Design dynamic web application using server and client side
5. Create Web application using Angular framework
6. Design responsive and secure dynamic web applications using modern web development frameworks and tools.

1. Robin Nixon (2017). Learning PHP, MySQL & JavaScript with jQuery, CSS & HTML5, (4/e) with jQuery, Thomson Press (India) Ltd., Delhi.
2. K.Meena, R.Slvakumar, A .B.Karthick Anand Babu, Web Programming with PHP and Mysql, Himalaya Publications. Mumbai, 2012. (ISBN: 978- 93 - 5051 - 581• 5).

1. Brad Dayley, Brendan Dayley, Caleb Dayley (2018), Node.js, MongoDB and Angular Web Development: The definitive guide to using the MEAN stack to build web applications (Developer's Library), (2/e), Pearson education
2. Ralph Moseley, M.T. Savaliya, (2013). Developing Web Applications, (2/e), Wiley India Pvt. Ltd., New Delhi.
3. Nicholas C. Zakas (2012). Professional JavaScript for Web Developers (3/e), Wiley India Pvt. Ltd., New Delhi.

1. https://www.tutorialspoint.com/php/php_and_mysql.htm
2. <https://www.w3schools.com/angular/default.asp>
3. <https://angular.io/start>
4. <https://www.greengeeks.in/tutorials/make-dynamic-website/>

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
	CO1	2	2	3	3	3	2	3	3	3	3	3	3	3	3	3	3
	CO2	3	2	2	3	3	2	3	3	2	3	2	3	3	3	3	3
	CO3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	3
	CO4	3	2	3	3	3	2	3	3	3	3	2	3	3	3	3	2
	CO5	3	3	3	2	3	3	2	3	3	1	3	3	3	3	3	3
S-Strong (3)			M-Medium (2)			L-Low											



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI - 614016.

(For the candidates admitted in the academic year 2026 – 2027)

PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: II-DCEP-II(A) - DATA MINING TECHNIQUES AND TOOLS LAB

Ins. Hrs. /Week:2

Course Credit:2

Course Code:P26ITDE24AP

COURSE OBJECTIVES

1. To provide practical knowledge of data preprocessing and feature selection techniques for data mining applications.
2. To develop skills in implementing association rule mining techniques for discovering patterns in datasets.
3. To enable students to apply classification algorithms for predictive data analysis.
4. To develop understanding of clustering techniques and knowledge discovery methods for data analysis.
5. To provide practical exposure to text mining and workflow-based data mining processes.

EXERCISES

1. Feature Selection.
2. Implementation of Apriori Algorithm.
3. Bayes Classification.
4. Nearest Neighbor Classification.
5. K-Means Clustering Technique.
6. Exercise on Association Rule Mining.
7. Exercise on Knowledge Flow.
8. Exercise on Text Mining.

Total Lecture Hours : 30

COURSE OUTCOME

After successful completion of this course, students will be able to:

1. Apply preprocessing techniques for preparing datasets for analysis.
2. Use filtering and feature selection methods to improve data quality.
3. Implement association rule mining techniques using Apriori algorithm.
4. Apply classification techniques such as Bayes and Nearest Neighbor for predictive analysis.
5. Perform clustering and knowledge extraction using data mining tools.
6. Analyze textual data and develop solutions using text mining techniques.

TEXT BOOKS

1. Data Mining: Concepts and Techniques – Morgan Kaufmann Publishers.
2. Data Mining: Practical Machine Learning Tools and Techniques – Morgan Kaufmann Publishers.
3. Data Mining Techniques – Universities Press.
4. Introduction to Data Mining – Pearson.

REFERENCE BOOKS

1. Learning Data Mining with R – Chapman & Hall.
2. Principles of Data Mining – Prentice Hall.
3. Data Mining From Theory to Practice – PHI Learning.
4. Machine Learning – McGraw-Hill.

E-RESOURCES

1. [Weka Official Website](#)
2. [GeeksforGeeks – Data Mining Tutorial](#)
3. [Google Developers – Machine Learning Guides](#)
4. [TutorialsPoint – Data Mining Tutorial](#)
5. [NPTEL Courses](#)
6. [Tableau Learning Resources](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	3	3	3	2	3	3	2	3	2	3	3	3	3	3
CO3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	3
CO4	3	2	3	3	3	3	2	3	3	3	3	2	3	3	3	3	2
CO5	3	3	3	2	3	3	2	3	3	1	3	3	3	3	3	3	2

7. S-Strong (3)

M-Medium (2)

L-Low



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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: II-DCEP-II(B) - DIGITAL WATERMARKING AND STEGANOGRAPHY LAB

Ins. Hrs. /Week:2

Course Credit:2

Course Code:P26ITDE24BP

COURSE OBJECTIVES

1. To provide practical knowledge of digital watermarking techniques for securing multimedia information.
2. To develop skills in implementing spatial and frequency domain methods for watermark embedding and extraction.
3. To enable students to design and develop steganography applications for secure information hiding.
4. To develop understanding of steganalysis techniques and methods for detecting hidden information.
5. To provide practical exposure to multimedia security evaluation and secure information hiding systems.

EXERCISES

1. Implement Image Watermarking using Spatial Domain Techniques.
2. Implement Digital Watermarking using Frequency Domain Techniques.
3. Develop a program for Text Steganography.
4. Develop an application for Image Steganography using Least Significant Bit (LSB) Method.
5. Implement Audio Steganography for secure message embedding.
6. Develop a Video Steganography application.
7. Implement Watermark Extraction and Verification techniques.
8. Develop a program for Steganalysis and Hidden Data Detection.
9. Perform Image Quality Analysis using PSNR and MSE metrics.
10. Design and implement a secure multimedia information hiding system using Digital Watermarking and Steganography.

Total Lecture Hours : 30

COURSE OUTCOME

After successful completion of this course, students will be able to:

1. Understand the concepts and applications of Digital Watermarking and Steganography.
2. Implement data hiding techniques in text, image, audio, and video media.
3. Apply watermark embedding and extraction techniques for digital content protection.
4. Analyze the performance of steganography and watermarking using evaluation metrics.
5. Design secure multimedia systems for copyright protection and information security.
6. Evaluate and compare various information hiding algorithms and techniques.

TEXT BOOKS

1. Digital Watermarking and Steganography – Morgan Kaufmann Publishers.
2. Information Hiding: Steganography and Watermarking Attacks and Countermeasures – Springer.
3. Multimedia Security: Steganography and Digital Watermarking Techniques for Protection of Intellectual Property – CRC Press.

REFERENCE BOOKS

1. Digital Watermarking – CRC Press.
2. Data Hiding Fundamentals and Applications – Elsevier.
3. Computer and Information Security Handbook – Morgan Kaufmann.

E-RESOURCES

- [OpenCV Documentation](#)
- [TutorialsPoint – Steganography Tutorial](#)
- [GeeksforGeeks – Digital Watermarking](#)
- [NPTEL Courses](#)
- [IEEE Xplore Digital Library](#)
- [MATLAB Documentation](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
	CO1	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3	3
	CO2	3	2	2	3	3	3	2	3	3	2	3	2	3	3	3	3
	CO3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	3
	CO4	3	2	3	3	3	3	2	3	3	3	3	2	3	3	3	2
	CO5	3	3	3	2	3	3	2	3	3	1	3	3	3	3	3	3
S-Strong (3)			M-Medium (2)					L-Low									



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(For the candidates admitted in the academic year 2026 – 2027)

PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: II –DCEP-II (C) – WEB PROGRAMMING LAB

Ins. Hrs. /Week: 2

Course Credit:2

Course Code: P26ITDE24CP

COURSE OBJECTIVES

- To understand the fundamentals of client-side and server-side web programming techniques.
- To learn HTML, CSS, JavaScript, jQuery and PHP for developing dynamic web applications.
- To develop practical skills in form validation, event handling and file operations in web environments.
- To understand database connectivity and session management using PHP and MySQL.
- To design interactive, responsive and database-driven web applications using modern web technologies.

EXERCISE

1. Develop a Program to pass information between web pages using GET and POST methods.
2. Develop a Program string functions to manipulate strings.
3. Develop a Program to implement file operations.
4. Develop a Program to create menus, styles, Animation using CSS.
5. Develop a Program to validate the HTML form fields using Javascript.
6. Develop a Program to using jQuery and CSS.
7. Develop a Program to handle events and special effects using jQuery
8. Develop a Program to implement explode and implode functions
9. Develop a Program to create data base connectivity using PHP and MySQL
10. Using PHP, Create Admin Login, Logout form using session variables.

Total Lecture Hours : 30

COURSE OUTCOME

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

1. Develop dynamic web pages using HTML, CSS, JavaScript, PHP, and MySQL.
2. Implement client-side and server-side scripting techniques for web applications.
3. Design interactive web interfaces using CSS, animations, jQuery, and event handling.
4. Validate HTML form fields using JavaScript for secure and accurate data entry.
5. Apply PHP string handling and file handling operations in web development.
6. Create database-driven applications using PHP and MySQL connectivity.

TEXT BOOKS

1. Web Technologies – Oxford University Press.
2. Internet and World Wide Web How to Program – Pearson Education.
3. Programming PHP – O'Reilly Publications.
4. JavaScript and jQuery – Wiley Publications.

REFERENCE BOOKS

1. PHP and MySQL Web Development – Pearson Education.
2. HTML and CSS: Design and Build Websites – Wiley Publications.
3. Learning PHP, MySQL and JavaScript – O'Reilly Publications.
4. Web Programming with HTML5, CSS and JavaScript – Jones & Bartlett Learning.

E-RESOURCES

- [W3Schools Web Tutorials](#)
- [MDN Web Docs](#)
- [PHP Official Documentation](#)
- [jQuery Official Website](#)
- [MySQL Documentation](#)
- [JavaScript Info](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	3	3	3	2	3	3	2	3	2	3	3	3	3	3
CO3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	3
CO4	3	2	3	3	3	3	2	3	3	3	3	2	3	3	3	3	2
CO5	3	3	3	2	3	3	2	3	3	1	3	3	3	3	3	3	2

S-Strong (3)

M-Medium (2)

L-Low



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

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(For the candidates admitted in the academic year 2026 – 2027)

PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: II-GEC-II(A) -WIRELESS NETWORKS

Ins. Hrs. /Week:4

Course Credit:3

Course Code:P26ITGE22A

COURSE OBJECTIVES

1. To introduce the fundamentals of wireless communication systems and the evolution of wireless networks.
2. To provide knowledge of cellular network generations, including 1G to 5G technologies and architectures.
3. To develop understanding of wireless network operation, planning, and satellite communication systems.
4. To enable students to analyze wireless access technologies, wireless LANs, and broadband wireless systems.
5. To provide knowledge of personal area networks, wireless security mechanisms, and wireless network simulation techniques.

UNIT – I INTRODUCTION TO WIRELESS NETWORKS

(12 Hours)

Evolution of Wireless Networks – Challenges. Wireless Communications Principles and Fundamentals: The Electromagnetic Spectrum - Wireless Propagation Characteristics and Modelling - Analog and Digital Data transmission - Modulation Techniques for Wireless Systems - The Cellular Concept – Routers- Wireless Services. Principles of AIR-Interface Design - Characteristics of the Wireless Medium.

UNIT – II GENERATION OF CELLULAR SYSTEMS

(12 Hours)

First Generation (1G) Cellular Systems - Second Generation (2G Cellular Systems: Introduction – D-AMPS – CDMAone - GSM – IS-41 - Third Generation (3G) Cellular Systems: Introduction – 3G Spectrum Allocation – Service Classes and Application – Fourth Generation (4G) Systems. 5G Fundamentals and Architecture: Evolution of 5G, Need for 5G-5G RAN(Radio Access Networks)-Key features of 5G- Architecture: Key elements of 5G- 3GPP standards for 5G radio and core.

UNIT – III PRINCIPLES OF WIRELESS NETWORK OPERATION

(12 Hours)

Network Planning – Wireless Network Operation - Satellite Networks: Introduction- Satellite Systems - VSAT Systems - Examples of Satellite based Mobile Telephony Systems - Satellite-based Internet Access.

UNIT – IV FIXED WIRELESS ACCESS SYSTEMS

(12 Hours)

Wireless Local Loop versus Wired Access - Wireless Local Loop - Wireless Local Loop Subscriber Terminals (WLL) - Wireless Local Loop Interfaces to the PSTN, IEEE 802.16 Standards. Wireless Local Area Networks: Introduction - Wireless LAN Topologies - Wireless LAN Requirements - The Physical Layer - The Medium Access Control (MAC) Layer - Latest Developments. Wireless ATM: Introduction - Wireless ATM Architecture – HIPERLAN 2: An ATM Compatible WLAN.

UNIT – V PERSONAL AREA NETWORKS

(12 Hours)

Introduction to PAN Technology and Applications, Commercial Alternatives: Bluetooth - Commercial Alternatives: HomeRF. Security Issues in Wireless Systems: The Need for Wireless Network Security - Attacks on Wireless Networks- Security Services - Wired Equivalent Privacy (WEP) Protocol - Mobile IP -Weaknesses in the WEP Scheme - Virtual Private Network (VPN). Simulation of Wireless Network Systems.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only)

Internet of Things (IoT) networks,-software-defined networking-network virtualization-edge and fog computing.

Total Lecture Hours : 60

COURSE OUTCOME

After successful completion of this course, students will be able to:

1. Understand the fundamentals, architecture, and evolution of wireless communication networks.
2. Analyze wireless transmission principles, propagation models, and air-interface design concepts.
3. Differentiate various generations of cellular systems from 1G to 5G and their applications.
4. Explain the operation and design of wireless access technologies including WLAN, WLL, and satellite networks.
5. Evaluate security challenges and protection mechanisms in wireless network environments.
6. Design and analyze wireless networking solutions for modern communication applications.

TEXT BOOKS

1. Wireless Networks – John Wiley & Sons (Asia), 2003.
2. Wireless Communication and Networks – Pearson Education, 2002.
3. Principles of Wireless Networks: A Unified Approach – 2nd Edition, Pearson Education.
4. 5G Networks: Fundamental Requirements Enabling Technologies and Operations Management – Wiley-IEEE Press, 2018.

REFERENCE BOOKS

1. Wireless Communications – Cambridge University Press.
2. Mobile Communications – Pearson Education.
3. Wireless and Mobile Networks – Pearson.
4. Wireless Communications and Networking – Morgan Kaufmann.

E-RESOURCES

- [RF Wireless World – Wireless LAN Tutorial](#)
- [TutorialsPoint – Wireless Networks Tutorial](#)
- [3GPP Official Website](#)
- [IEEE Communications Society](#)
- [NPTEL Courses](#)
- [Cisco Networking Academy](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PS01	PS02	PS03	PS04	PS05	PS06	PS07
CO1	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	3	3	3	2	3	3	2	3	2	3	3	3	3	3
CO3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	3
CO4	3	2	3	3	3	3	2	3	3	3	3	2	3	3	3	3	2
CO5	3	3	3	2	3	3	2	3	3	1	3	3	3	3	3	3	2

• S-Strong (3)

M-Medium (2)

L-Low



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

SEMESTER: II-GEC-II(B) -BIG DATA FRAMEWORKS

Ins. Hrs. /Week:4

Course Credit:3

Course Code:P26ITGE22B

COURSE OBJECTIVES

- To introduce the concepts, characteristics, and applications of Big Data and Big Data Analytics.
- To provide knowledge of Hadoop architecture, HDFS, and distributed storage mechanisms for large-scale data processing.
- To develop understanding of MapReduce programming and distributed computing frameworks in Hadoop.
- To enable students to manage and analyze Big Data using Hive and HBase technologies.
- To provide practical knowledge of Apache Pig and data processing techniques for Big Data applications.

UNIT – I FUNDAMENTALS OF BIG DATA

(12 Hours)

Fundamentals of Big Data Understanding Big Data: Concepts and Terminology – Big Data Characteristics – Types of Data – Case Study Background – Drivers for Big Data Adoption: Information and Communication Technology – Big Data Analytics Lifecycle.

UNIT – II FUNDAMENTALS OF HADOOP

(12 Hours)

Fundamentals of Hadoop Core components of Hadoop- Apache Hadoop – HDFS Daemons – MapReduce Daemons – HDFS High Availability Daemons – Benefits and Challenges of HDFS – File Sizes, Block Sizes and Block Abstraction in HDFS – Data Replication – How does HDFS Store, Read, and Write Files – Data Serialization Options – File System Shell Commands for HDFS.

UNIT – III HDFS AND MAPREDUCE

(12 Hours)

HDFS and MapReduce Choosing Key and Value Types for MapReduce Jobs – The Relationship of Input Keys to Output Keys – Sorting Keys and Values – Sort and Shuffle Process – MapReduce Job Configuration and Submission Hadoop Distributed File System – MapReduce Framework – Setting the Environment – Hadoop Cluster Modes – Running a MapReduce Job with the MR1Framework - Running a MapReduce Job with the Yarn Framework – Running Hadoop Streaming.

UNIT – IV HIVE AND HBASE

(12 Hours)

Hive and HBase Apache Hive: Setting the Environment – Configuring Hadoop, Hive – Starting HDFS, Hive Server, CLI – Creating and Using a Database– Creating a Managed Table – Loading data into a Table – Creating a Table using LIKE – Adding Data into a Table from Queries – Adding Data using INSERT INTO TABLE - Adding Data using INSERT OVERWRITE – Creating a table using CREATE TABLE AS SELECT – Altering, Truncating and Dropping a Table– Creating an External Table.

Unit – V APACHE PIG

(12 Hours)

Pig Introduction – Installing and Running Pig – Grunt – Pig's Data Model – Introduction to Pig Latin – Advanced Pig Latin – Developing and Testing Pig Latin Scripts – Making Pig Fly – Writing Evaluation and Filter Functions – Writing and Loading Store Function

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

COURSE OUTCOME

After successful completion of this course, students will be able to:

1. Understand the concepts, characteristics, evolution, and lifecycle of Big Data Analytics.
2. Analyze Hadoop architecture and apply HDFS concepts for distributed data storage and processing.
3. Implement MapReduce programming models for large-scale data processing.
4. Develop and manage distributed data applications using Hadoop ecosystem tools such as Hive and HBase.
5. Apply Pig and Pig Latin scripts for data transformation and analytics.
6. Design and implement Big Data solutions using parallel and distributed computing techniques.

TEXT BOOKS

1. Programming Pig – O'Reilly Publication, 2011.
2. Practical Hadoop Ecosystem: A Definitive Guide to Hadoop-Related Frameworks and Tools – Apress, 2016.
3. Big Data Fundamentals: Concepts Drivers and Techniques – Service Tech Press, 2015.
4. The Little Book on Big Data – New Street Publishers, 2012.
5. Data Analytics – McGraw Hill Education, 2017.

REFERENCE BOOKS

1. Hadoop: The Definitive Guide – O'Reilly Media.
2. Big Data Analytics – Wiley.
3. Data Science for Business – O'Reilly Media.
4. Mining of Massive Datasets – Cambridge University Press.

E-RESOURCES

- [DataFlair – Hadoop Ecosystem Components](#)
- [Apache Hadoop MapReduce Tutorial](#)
- [JavaTpoint – Apache Hive Tutorial](#)
- [TutorialsPoint – Apache Pig Tutorial](#)
- [Apache Hadoop Official Documentation](#)
- [NPTEL Courses](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PS01	PS02	PS03	PS04	PS05	PS06	PS07
CO1	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	3	3	3	2	3	3	2	3	2	3	3	3	3	3
CO3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	2	3
CO4	3	2	3	3	3	3	2	3	3	3	3	2	3	3	3	3	2
CO5	3	3	3	2	3	3	2	3	3	1	3	3	3	3	3	3	2

S-Strong (3)

M-Medium (2)

L-Low



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

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PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

Semester: II– GEC-II(C) –INTERNET OF THINGS

Ins. Hrs. /Week:4

Course Credit: 3

Course Code:P26ITGE22C

COURSE OBJECTIVES

- To understand the fundamentals, architecture and enabling technologies of the Internet of Things (IoT).
- To learn IoT system architecture, communication protocols and design methodologies for smart applications.
- To develop practical skills in interfacing IoT devices using Raspberry Pi and Arduino platforms.
- To understand cloud integration, RESTful APIs and industrial IoT applications.
- To design and implement IoT-based solutions for real-world smart systems and industrial environments.

UNIT - I BASICS OF INTERNET OF THINGS

(12 Hours)

Definition – Characteristics – Physical Design of IoT– Logical Design of IoT– IoT Enabling Technologies – IoT Levels and Deployment Templates – **Domain Specific IoT:** Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health, and Lifestyle.

UNIT - II IoT ARCHITECTURE AND DESIGN METHODOLOGY

(12 Hours)

M2M high-level ETSI architecture – IETF architecture for IoT – **IoT and M2M:** M2M – Difference between IoT and M2M – SDN and NFV for IoT. IoT System Management – Need for System Management – SNMP – Network Operator Requirements – NETCONF –YANG – IoT Systems Management with NETCONF-YANG – IoT Design Methodology.

UNIT - III IoT WITH RASPBERRY Pi

(12 Hours)

IoT Device – Raspberry Pi Board – Linux on Raspberry Pi – Raspberry Pi interfaces – Programming Raspberry Pi with Python – Other IoT devices – Cloud Storage Models and Communication APIs: WAMP – Xively Cloud for IoT– Django – Designing RESTful Web API

UNIT - IV IoT WITH ARDUINO

(12 Hours)

Arduino Basics: Hardware Requirements – Software Requirements – Arduino Programming. Internet Connectivity: Arduino Uno Wired Connectivity – Arduino Uno Wireless Connectivity – Arduino Yun Wireless Connectivity. Communication Protocols: HTTP – MQTT

UNIT - V INDUSTRIAL APPLICATIONS

(12 Hours)

Cisco IoT system – IBM Watson IoT Platform – Manufacturing – Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model – Smart and Connected Cities: Layered Architecture, Smart Lighting, Smart Parking Architecture, and Smart Traffic Control.

UNIT-VI (Self Study)

IoT Security and Privacy Challenges- Cloud-Based IoT Analytics and Big Data Processing- Case Studies on Smart City and Industrial IoT Applications.

Total Lecture Hours-60

COURSE OUTCOME

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

1. Understand the fundamentals of IOT
2. Analyze the Design of IOT systems
3. Develop programs for IOT systems
4. Identify wireless sensor networks
5. Understand protocols and routing methods for wireless sensor networks
6. Design intelligent IoT-based solutions integrating sensors, cloud platforms and communication technologies for real-world applications.

TEXT BOOKS

1. Arshdeep Bahga and Vijay Madisetti, , “Internet of Things: Hands-on Approach”, UniversityPress, Hyderabad, 2015
2. Kazem Sohraby, Daniel Minoli and TaiebZnati, “Wireless Sensor Networks: Technology, Protocols and Application”, Wiley Publications, New Delhi, 2010.

REFERENCE BOOKS

1. Carlos De Moraes Cordeiro and Dharma Prakash Agrawal, “Ad Hoc and Sensor Networks: Theory and Applications”, World Scientific Publishing, 2011.
2. Edgar Callaway, “Wireless Sensor Networks: Architecture and Protocols”, Auerbach Publications, 2003.
3. Erdal cayircı and Chunming Rong, “Security in Wireless Ad Hoc and SensorNetworks”, John Wiley and Sons, 2009.
4. Michael Miller, “The Internet of Things”, Pearson Education, India, 2015.
5. Waltenegus Dargie and Christian Poellabauer, “Fundamentals of Wireless Sensor Networks: Theory and Practice”, John Wiley and Sons Ltd, 2010.

E-RESOURCES

1. <https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/>
2. <https://data-flair.training/blogs/iot-applications/>
3. <https://www.sciencedirect.com/topics/computer-science/wireless-sensor-networks>

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
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CO2	3	3	2	3	3	3	3	3	2	3	2	3	3	3	3	3	2
CO3	2	3	2	3	3	3	2	3	3	3	3	3	3	2	3	3	3
CO4	3	2	3	2	3	2	3	3	3	2	2	3	3	3	3	3	3
CO5	3	3	3	3	2	3	3	2	3	3	3	3	2	3	2	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)



Semester: II– SEC-II –NODE JS

Ins. Hrs. /Week: 2

Course Credit: 2

Course Code: P26SEIT22

COURSE OBJECTIVES

- To understand the fundamentals and architecture of Node.js for server-side web application development.
- To learn asynchronous programming, event-driven concepts and core modules in Node.js.
- To develop web applications and RESTful APIs using Express.js framework.
- To understand database integration, real-time communication and deployment techniques using Node.js.
- To build scalable, secure and high-performance server-side applications using modern Node.js technologies and tools.

UNIT I – INTRODUCTION TO NODE.JS

(6 Hours)

Introduction to Server-Side JavaScript-Features and Architecture of Node.js-Installing Node.js and npm-Node.js Runtime Environment-Event-Driven Programming-Asynchronous Programming Concepts-Node.js Modules-File System Operations-Buffers- Streams and Events

UNIT II – NODE.JS CORE MODULES AND WEB SERVER

(6 Hours)

Working with Core Modules-HTTP Module-Creating Web Servers-URL and Query String Modules-File Upload Handling-Working with JSON Data-Event Loop and Callback Functions-Error Handling in Node.js-Package Management using npm

UNIT III – EXPRESS.JS FRAMEWORK

(6 Hours)

Introduction to Express.js-Routing in Express.js-Middleware Functions-Request and Response Handling Template Engines-RESTful API Development-CRUD Operations-Authentication and Authorization-Session and Cookie Management

UNIT IV – DATABASE CONNECTIVITY AND REAL-TIME APPLICATIONS

(6 Hours)

Database Integration with Node.js-Working with MongoDB-Mongoose ODM-MySQL Connectivity Data Validation Techniques-Real-Time Communication using Socket.IO-Chat Application Development-API Testing Tools-Deployment Basics

UNIT V – ADVANCED NODE.JS APPLICATIONS

(6 Hours)

Asynchronous Programming with Promises and Async/Await-Microservices Architecture-Node.js Security Best Practices-Performance Optimization-Logging and Debugging-Testing Frameworks Cloud Deployment of Node.js Applications-Introduction to DevOps with Node.js-Future Trends in Node.js Development

UNIT-VI CURRENT CONTOURS (For continuous internal assessment only Self Study):

Real-Time Applications using WebSockets- Security and Performance Monitoring in Node.js- Case Studies on Modern Full-Stack Web Applications

COURSE OUTCOME

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

1. Explain the architecture and programming concepts of Node.js
2. Develop server-side applications using Node.js and Express.js Implement RESTful APIs and database connectivity in Node.js applications
3. Analyze asynchronous operations and real-time communication techniques.
4. Design scalable and secure web applications using Node.js technologies.
5. Design secure and efficient full-stack applications using Node.js and modern web technologies.
6. Implement database connectivity, authentication and real-time communication in Node.js applications.

TEXT BOOKS

1. Alex Young and Marc Harter, Node.js in Action, 2nd Edition, Manning Publications, 2017.
2. Ethan Brown, Web Development with Node and Express, 2nd Edition, O'Reilly Media, 2019.
3. Shelley Powers, Learning Node, 2nd Edition, O'Reilly Media, 2016.

REFERENCE BOOKS

1. David Herron, Node.js Web Development, 5th Edition, Packt Publishing, 2020.
2. Sandro Pasquali, Mastering Node.js, Packt Publishing, 2017.
3. Brad Dayley, Node.js, MongoDB and Angular Web Development, Addison-Wesley Professional, 2018.
4. Azat Mardan, Practical Node.js, Apress, 2018.
5. Mike Cantelon, Marc Harter, T. J. Holowaychuk and Nathan Rajlich, Node.js in Practice, Manning Publications, 2015.

E-RESOURCES

1. [Node.js Official Documentation](#)
2. [Express.js Official Documentation](#)
3. [MongoDB Documentation](#)
4. [NodeSchool Interactive Tutorials](#)
5. [freeCodeCamp – Node.js Tutorials](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
	CO1	3	2	3	2	3	3	3	2	3	3	3	3	2	3	2	3	3
	CO2	3	3	2	3	2	2	3	3	3	2	3	3	3	3	2	3	3
	CO3	3	3	3	3	3	2	2	3	2	3	3	2	2	3	3	3	3
	CO4	2	3	2	3	3	3	3	3	3	2	2	3	3	2	3	2	3
	CO5	3	2	3	3	3	3	3	2	3	3	2	3	3	3	3	3	2
	S-Strong (3)			M-Medium (2)			L-Low (1)											

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE



(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI - 614016.

(For the candidates admitted in the academic year 2026 – 2027)

PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Sc., INFORMATION TECHNOLOGY

Semester: II– NMEC-I – INTERNET AND WEB BASICS

Ins. Hrs. /Week: 2

Course Credit: 2

Course Code: P26NMECS21

COURSE OBJECTIVES

- To understand the fundamentals of the Internet and World Wide Web.
- To learn the structure and development of web pages using HTML and CSS.
- To develop interactive web pages using JavaScript and client-side scripting techniques.
- To understand web hosting, networking concepts, and Internet security mechanisms.
- To explore emerging web technologies and modern web application trends.

UNIT-I INTRODUCTION TO CLOUD COMPUTING

(6 Hours)

Cloud Computing Basics –History of cloud computing-Importance of Cloud Computing in the current Era-Characteristics of Cloud Computing Pros and Cons of Cloud Computing

UNIT II TYPES OF CLOUD

(6 Hours)

Public and Private Cloud - Cloud Infrastructure. Working of Cloud Computing: Trends in Computing- Cloud services models – Cloud Deployment Models.

UNIT III CLOUD COMPUTING TECHNOLOGY

(6Hours)

Cloud Life Cycle Model- Reference Model for Cloud Computing. Foundations: Introduction to Virtualization-Types of Virtualization-Virtual Clustering.

UNIT IV CLOUD COMPUTING TOOLS

(6 Hours)

Moving Applications to the Cloud – Cloud Opportunities - Cloud Mashaps – Apache Hadoop – Cloud Tools.

UNIT V CLOUD APPLICATIONS

(6 Hours)

Microsoft Cloud Services - **Google Cloud Applications:** Google Applications Utilizing Cloud- Google App Engine. **Amazon Cloud Services:** Understanding Amazon Web Components and Services-Elastic Compute Cloud.

UNIT-VI CURRENT CONTOURS (For continuous internal assessment only Self Study):

Cloud Security and Privacy Issues- Cloud Migration Strategies and Challenges- Case Studies on Real-Time Cloud Applications.

Total Lecture Hours-30

COURSE OUTCOME

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

1. Explain the concepts, architecture, and services of the Internet and Web technologies
2. Develop web pages using HTML and CSS for effective presentation of information.
3. Implement client-side scripting techniques using JavaScript to create dynamic web applications.
4. Analyze web hosting environments, networking concepts, and security requirements of web systems
5. Design simple web applications by integrating modern web technologies and best practices.
6. Evaluate emerging trends in web technologies, web accessibility, SEO, Progressive Web Applications (PWA), and cloud-based web solutions

TEXT BOOKS

1. Internet and World Wide Web – How to Program, Paul Deitel, Harvey Deitel, Pearson Education, 6th Edition, 2020.
2. Web Technologies, Uttam K. Roy, Oxford University Press, 2018.

REFERENCE BOOKS

1. HTML and CSS: Design and Build Websites, Jon Duckett, Wiley Publications, 2014.
2. JavaScript and JQuery: Interactive Front-End Web Development, Jon Duckett, Wiley Publications, 2015.
3. Web Technologies: Black Book, Dreamtech Press, 2019.
4. Learning Web Design, O'Reilly Media, 5th Edition, 2018.

E-RESOURCES

1. [W3Schools Web Development Tutorials](#)
2. [MDN Web Docs](#)
3. [HTML5 Tutorial by TutorialsPoint](#)
4. [CSS Tutorial by TutorialsPoint](#)

COURSE LEARNING OUTCOME (FOR MAPPING WITH POS AND PSOS)

COURSE OUTCOMES	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	PS01	PS02	PS03	PS04	PS05	PS06	PS07
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	2	3	3	3	3	3	3	3	2	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3
CO4	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

S-Strong (3)

M-Medium (2)

L-Low (1)