Government College of Engineering, Aurangabad
Chhatrapati Sambhajinagar
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Department Of Computer Science and Engineering

Curriculum Structure

TY, B.Tech. (CSE)

From Academic Year 2025-26
As Per Nep

Prof. Sudhir Shikalpure
Head, CSE

Dr. Anil Karwankar
Dean Academics

Approved Updated Curriculum in XXIXth Academic Council
Dated: 25th March 2025

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Vision of the Institute

In pursuit of global competitiveness, the institute is committed to excelling in engineering education and research with concern for the environment and society.

Mission of the Institute

- ➔ Provide a conducive environment for academic excellence in engineering education.
- ➔ Enhance research and development along with promotion to sponsored projects and industrial consultancy.
- ➔ Foster the development of students by creating awareness of the needs of society, sustainable development, and human values.

Vision of the Computer Science & Engineering Department

To develop cultured and technically competent computer professionals and scholars with sustained growth in employability, high-impact research outcomes, and to become a genuine asset to industry and society.

Mission of the Computer Science & Engineering Department

- ➔ Developing Creativity and Logical Reasoning amongst the learners
- ➔ Updating curricula according to industry requirements and standards
- ➔ Promote leadership quality, social accountability, and ethics in a disciplined environment, quality Education.
- ➔ Creating an environment conducive to research

Program Outcomes

Engineering Graduates will be able to:

PO1: Apply knowledge of mathematics, science, and algorithms in solving complex Computer engineering problems.

PO2: Generate solutions by conducting experiments and applying techniques to analyse and interpret data.

PO3: Design components or processes to meet the needs within realistic constraints.

PO4: Identify, formulate, and solve Software Engineering, Networking, and Data Mining problems.

PO5: Comprehend professional and ethical responsibility in the computing profession.

PO6: Express effective communication skills.

PO7: Participate in a global, economic, environmental, and societal context.

PO8: Recognize the need for, and an ability to engage in lifelong learning.

PO9: Knowledge of contemporary issues and emerging developments in the computing profession.

PO10: Utilize the techniques, skills, and modern computer Engineering tools, Software, and techniques necessary for Engineering practice.

PO11: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.

PO12: Design research problems and conduct research in a computing environment.

Program Specific Outcomes

Computer Science and Engineering Graduates will be able to:

PSO1: Ability to apply probability, statistics, programming applications, and science in the development of computing solutions in appropriate areas for system software, database, networking, web development, network security, & Operating systems.

PSO2: Ability to apply standard practices & methods in software project management and development using suitable programming environments & tools to deliver a quality product for the industry.

PSO3: Able to apply ethical, social, and professional fields with proper communication skills & teamwork & pursue lifelong learning

General Course Structure & Theme

A. Definition of Credit

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hours Practical (P) per week	1 Credit

B. Total Credits for the completion of B.Tech. in Computer Science & Engineering:

The total number of credits proposed for the four-year B. Tech in Computer Science & Engineering (CSE) with 1 Multidisciplinary minor (Compulsory) degree is 170 as per the structure given below:

C. Semester-wise Credit Distribution Structure for 4-Year UG Program in Computer Science & Engineering with One Multidisciplinary Minor

Semester		I	II	III	IV	V	VI	VII	VIII	Total
Basic Science Course	BSC/ESC	8	8		--	--	--	--	--	16
Engineering Science Course		7	7		--	--	--	--	--	14
Program Core Course (PCC)	Program Courses	--	2	11	11	10	8	8	0	50
Program Elective Course (PEC)		--	--		4	8	8	0	20	
Multidisciplinary Minor (MD M)	Multidisciplinary Courses		--	4	3	4	3	0	0	14
Open Elective (OE) Other than a particular program		--	3	3	2	--	--	--	8	
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	2	2	--	2	--	2	--	--	8
Ability Enhancement Course (AEC01, AEC02)	Humanities Social Science and Management (HSSM)		2		2	--	--	--	--	4
Entrepreneurship/Economics / Management Courses			2	2	--	--	--	--	4	
Indian Knowledge System (IKS)		2	--	--	--	--	--	--	2	
Value Education Course (VEC)		--	2	2	--	--	--	--	4	
Research Methodology	Experimental Learning Courses	--	--	--	--	--	--		4	4
Comm. Eng. Project (CEP)/Field Project (FP)		--	2	--	--	--	--	--	2	
Project		--	--	--	--	--	4		4	
Internship/ OJT		--			--	--		12	12	
Co-curricular Courses (CC)	Liberal Learning Courses	2	2		--	--	--	--	--	4
Total Credits (Major)		**21**	**23**	**27**	**24**	**20**	**25**	**20**	**16**	**170**

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D. Multidisciplinary Minor

Students can opt for any of the following as per the rules and regulations given by the institute:

1. B. Tech with one Multidisciplinary Minor = Total 170 Credits
2. B. Tech with one Multidisciplinary Minor and Honors in A.I.M.L / programming paradigm = Total 188 Credits
3. B. Tech with one Multidisciplinary Minor and Honors by Research = Total 188 Credits B. Tech with two Multidisciplinary Minors = Total 184 Credits

I. Artificial intelligence / Machine learning Group

Sr. No.	Category	Course Title	Sem.	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1	MDM 5001/5002	Introduction to Data Science	III	3	0	1	**04**
2	MDM 5003	Introduction To Machine Learning	IV	3	0	0	**03**
3	MDM 5004/5005	Artificial Intelligence	V	3	0	1	**04**
4	MDM 5006	Neural Network	VI	3	0	0	**03**
Total Credits							**14**

II. Programming Group

Sr. No.	Category	Course Title	Sem.	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1	MDM 6001/6002	C programming	III	3	0	1	**04**
2	MDM 6003	Object Oriented Programming	IV	3	0	0	**03**
3	MDM 6004/6005	Java Programming	V	3	0	1	**04**
4	MDM 6006	Python Programming	VI	3	0	0	**03**
Total Credits							**14**

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E. Open Electives

In addition to the above courses following courses are offered as Open Electives (OE) by the Computer Science & Engineering Department

Sr. No.	Category	Course Title	Sem.	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1	OE	Design Thinking/ Critical Thinking	III	3	0	0	**03**
2	OE	PECL/Software Development Cycle	IV	3	0	0	**03**
3	OE	Behavioural Science & Organization	V	2	0	0	**02**
Total Credits							**08**

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Semester V

Tentative **Teaching and Evaluation Scheme**

Third Year B. Tech. Program in Computer Science and Engineering Multidisciplinary Minor

from 2025-26 as per NEP

Course				Teaching Scheme			Continuous Evaluation in terms of Marks					
#	Cate-gory	Course Code	Course Name	TH	T	PR	Credits	ISE I	ISE II	ISE III	ESE	Total (100)
1	PCC	CSPCC 3001	Design and Analysis of Algorithms	3			3	15	15	10	60	100
2	PCC	CSPCC 3002	Principles of Software Engineering	3	-	-	3	15	15	10	60	100
3	PCC	CSPCC 3003	Formal Language and Automata Theory	3			3	15	15	10	60	100
4	PCC	CSPCC 3004	Lab Design and Analysis of Algorithms	-	-	2	1		-	25	25	50
5	MDM	MDM 5004 or 6004	Multidisciplinary Minor	3			3	15	15	10	60	100
6	PECI	CSPEC 3001, 02, or 03	Program Elective Core I	3	-		3	15	15	10	60	100
7	OE3	CSOEC 0030	Open Elective III	2	-	-	2	10	10	--	30	50
8	PECI	CSPEC 3004, 05, or 06	Lab Program Elective Core I			2	1			25	25	50
9	Lab MDM	MDM 5005 or 6005	Lab Multidisciplinary Minor			2	1					
Total				17	0	6	21	85	85	100	380	650

Professional Elective I

1. Data Mining and Data Warehousing
2. Cloud Computing
3. Image Processing

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Semester VI

Tentative Teaching and Evaluation Scheme

Third Year B. Tech. Program in Computer Science and Engineering Multidisciplinary Minor

from 2025-26 as per NEP

Course				Teaching Scheme			Continuous Evaluation in terms of Marks					
#	Cate-gory	Course Code	Course Name	TH	T	PR	Credits	ISE I	ISE II	ISE III	ESE	Total (100)
1	PCC	CSPCC 3005	Computer Network	3	-	-	3	15	15	10	60	100
2	PCC	CSPCC 3006	Principles of Compiler Design	3	-	-	3	15	15	10	60	100
3	PEC-2	CSPEC 3007, 08, or 09	Program Elective Core II	3	-	-	3	15	15	10	60	100
4	PEC-3	CSPEC 3010, 11, or 12	Program Elective Core III	3	-	-	3	15	15	10	60	100
5	PCC	CSPCC 3007	Lab Computer Network			2	1			25	25	50
6	PCC	CSPCC 3008	Lab Compiler Design			2	1			25	25	50
7	PEC2	CSPEC 3013, 14, or 15	Lab Program Elective Core II	-	-	2	1		-	25	25	50
8	PEC3	CSPEC 3016, 17, or 18	Lab Program Elective Core III	-	-	2	1		-	25	25	50
9	MDM	MDM 5006 or 6006	Multidisciplinary Minor	3			3	15	15	10	60	100
10	VSEC	CSVEC 3001	CP/SDL2 (Java, React, or Web Tech)			4	2			50	50	100
Total				15		12	21	90	90	210	510	800

Professional Elective II

1. Machine Learning
2. Computer Vision
3. Software Testing and Quality Assurance

Professional Elective III

1. Natural Language Processing
2. Neural Network
3. Cryptography & Network Security

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CSPCC3001: Design and Analysis of Algorithms

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite
Data Structures

Course description
This Course describes the techniques of design and analysis of algorithms. Topics like Divide and Conquer, Greedy and Dynamic programming, and Backtracking will be covered. Students will also learn to analyse the performance of algorithms.

Course Outcomes
After successful completion of the course, students will be able to:

- **CO1:** Describe asymptotic notation, its properties, and its use in measuring algorithm behaviour.
- **CO2:** Apply mathematical principles to solve various problems t
- **CO3:** Analyse and apply the complexities of various algorithms and select the best
- **CO4:** Know the different strategies that are known to be useful in finding efficient algorithms to solve problems and to be able to apply them.
- **CO5:** Use appropriate data structures and algorithms to solve a particular problem

Detailed Syllabus

UNIT I	**Introduction To Algorithms** What Is an Algorithm, Application of Algorithms, Performance Analysis- Space Complexity, Time Complexity, Asymptotic Notation, And Divide-And-Conquer Introduction, Binary Search-Iterative and Recursive, Finding the Maximum and Minimum, Merge Sort, Insertion Sort, Selection Sort, Quick Sort, Heap Sort.
UNIT II	**Greedy Method** Introduction, 0/1 Knapsack Problem, Job Scheduling, Huffman Codes, Minimum Cost Spanning Trees- Prim's Algorithm, Kruskal's Algorithm, Optimal Merge Patterns.
UNIT III	**Dynamic Programming** Multistage Graphs, All Pairs Shortest Path, Single Source Shortest Path, Optimal Binary Search Tree, Traveling Salesman Problem, Flow Shop Scheduling.
UNIT IV	**Back Tracking** Introduction, 8 Queens' Problem, Sum of Subset, Graph Colouring, Hamiltonian Cycles, Branch and Bound
UNIT V	**Basic Traversal and Search Techniques** Techniques For Binary Trees, Techniques for Graphs- Breadth First Search and Traversal, Depth First Search and Traversal, Connected Components and Spanning Trees.

Text Books

- Horowitz, Sahani, Rajasekaran, Fundamentals of Computer Algorithms, Golgotha Publication, 2nd Edition
- Introduction to the Design and Analysis of Algorithms, Anany Levitin, 3rd Edition, 2017, Pearson
- Design and Analysis of Algorithms, S. Sridhar, 2nd Edition, Oxford University Press, 2023
- Ahlman, Hopcroft, Design and Analysis of Computer Algorithms, Addison-Wesley, 1st Edition

Reference Book

- Cormen, Leiserson, Rivest, Stein, Introduction to Algorithms, PHI. 4th Edition

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1									1		1
CO2	3	2	2	3						2		1	1		1
CO3	2	2	1	3						3		1	1	2	1
CO4	2	2	2	3						3		1	2	2	1
CO5	2	2	1	3						3		1	2	2	1
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

Teachers' Assessment of 10 marks is based on one / or a combination of the following

- Tutorials
- Problem Solving
- PowerPoint presentation of case studies
- Question & answer / Numerical solution

Assessment Pattern

Level No.	Knowledge Level	ISE I & ISE II	ISE III	ESE
K1	Remember	15	5	15
K2	Understand	15	00	20
K3	Apply	00	5	25
K4	Analyse	00	00	00
K5	Evaluate	00	00	00
Total Marks: 100		30	10	60

Assessment table

Assessment Tool	K1	K2	K3	K1	K3
	C01	C02	C03	CO4	CO5
ISE I & II (30 Marks)	15	10	05	00	00
ISE III (10 Marks)	05	00	00	05	00
ESE Assessment (60 Marks)	15	15	10	10	10

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CSPCC3002: Principles of Software Engineering

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

Basic Programming Knowledge

Course description

Software Engineering is the process of designing, developing, testing, and maintaining software. It is a systematic and disciplined approach to software development that aims to create high-quality, reliable, and maintainable software.

- ➔ Software engineering includes a variety of techniques, tools, and methodologies, including requirements analysis, design, testing, and maintenance.
- ➔ It is a rapidly evolving field, and new tools and technologies are constantly being developed to improve the software development process.
- ➔ By following the principles of software engineering and using the appropriate tools and methodologies, software developers can create high-quality, reliable, and maintainable software that meets the needs of their users.

Course Outcomes

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

- **CO1:** Comprehend the basic computer engineering concepts through the SDLC life cycle, models, and the Modern Agile process in software engineering
- **CO2:** Integrate the requirements from the customer for software development
- **CO3:** Apply the design concept to develop the system
- **CO4:** Apply the “Golden Rules” for user interface level design.
- **CO5:** Formulate a test strategy and ethically work to achieve the quality of the product

Detailed Syllabus

UNIT I	**Introduction To Software Development Process and Management** Introduction To Software Engineering, Software Crisis and Myths, Software Development Life Cycle and Models: Maturity Model, Process Models-Waterfall, Evolutionary, Incremental, etc., What Is an Agile View of Process.
UNIT II	**Requirements Engineering** Requirements Engineering and Management. Initiating, Eliciting Requirement, Developing Use Cases, Building the Analysis Model, Negotiating and Validating Requirement.
UNIT III	**An Architectural Design** Software Architecture, Data Design, Architectural Styles and Patterns, Architectural Design, Assessing Alternative Architectural Design Mapping Data Flow into Software Architecture

UNIT IV	**User Interface Level Design and Estimation** The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation, Project Estimation.
UNIT V	**Introduction To Software Testing:** Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Software Quality, Framework for Product Metrics.

Text Books

- Software Engineering – Practitioner Approach – Roger S. Pressman 8th Edition, 2014, McGraw-Hill Education
- Software Engineering by Ian Sommerville; Pearson Edu 10th Edition 2017

Reference Book

- Object Oriented Analysis and Design with Applications, Grady Booch, 3rd Edition, 2007, Pearson Education

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	1	2	3					1	2					
CO2	3	1	2	3					1	2					
CO3	2	1	2	3					1	2				2	
CO4	3	1	2	3					1	2					
CO5	1	1	2	3					2	3			3		
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- Quiz
- Assignments
- Question and answer
- PowerPoint presentation

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Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	05	00	00	10
K2	Understand	05	05	00	10
K3	Apply	05	05	00	10
K4	Analyse	00	05	05	10
K5	Evaluate	00	00	00	20
K6	Create	00	00	05	00
Total Marks: 100		15	15	10	60

Assessment table

Assessment Tool	K1, K2	K3
	CO1, CO2	CO3, CO4, CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	05	10
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	20	40
Total Marks: 100		

Special Instructions

None

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CSPCC3003: Formal Language and Automata Theory

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

Discrete Mathematical Structures

Course description

This course provides a set of abstract structures that are useful for solving certain classes of problems. It describes properties and design methods, and corresponding languages of Finite automata, pushdown automata, and Turing machines.

Course Outcomes

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

- **CO1:** Overview of the theoretical foundations of computer science from the perspective of formal languages
- **CO2:** Illustrate finite state machines to solve problems in computing
- **CO3:** Create Automata for different languages and regular expressions.
- **CO4:** Solve various problems of applying normal form techniques, pushdown automata, and Turing Machines
- **CO5:** Explain the hierarchy of problems arising in the computer sciences.

Detailed Syllabus

UNIT I	**Automata:** Why study automata theory? Introduction to formal proof, Inductive Proofs, and the central concept of automata theory. Finite Automata: Deterministic Finite automata, Nondeterministic finite automata, An Application: Text Search, Finite automata with Epsilon–Transitions.
UNIT II	**Regular Expressions and Languages:** Regular expressions, Finite automata, and regular expressions, Applications of regular expressions, Algebraic Laws for Regular Expressions. Properties of Regular Languages: Proving Languages not to be regular, Closure properties of regular Languages, Decision properties of Regular Languages, Equivalence and minimization of Automata.
UNIT III	**Context Free Grammars and Languages:** Context Free Grammars, Parse Trees, Application of Context Free Grammars, Ambiguity in Grammars and Languages. Push Down Automata: Definition of the Pushdown Automaton, The Languages of a PDA, Equivalence of PDAs and CFGs, Deterministic Pushdown Automaton.
UNIT IV	**Properties of Context Free Languages:** Normal Forms for Context Free Grammars, The Pumping Lemma for Context Free Languages, Closure Properties of Context Free Languages, and Decision Properties of CFLs.

UNIT V	**Introduction to Turing Machine:** Problems that computers cannot solve, The Turing Machine, Programming Techniques for Turing machines, Extensions to the basic Turing Machines, Turing machines and Computers, Undecidable Problems about Turing machines. An Introduction to Intractable Problems.

Text and Reference Books

- Hopcroft & Ullman, Introduction to Automata Theory, Languages, and Computation, 3rd edition. Pearson Education.
- John C. Martin, Introduction to Languages and Theory of Computation, 2nd edition, TMH.
- K.L.P. Mishra, N. Chandrasekaran, Theory of Computer Science: Automata, Languages and Computation, 2nd Edition, PHI.

Web Resources

- NPTEL course: Theory of computation (IITK): https://nptel.ac.in/courses/106104148

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	1	2					1		1					
CO2	2	2	2	1						2	2				
CO3		2	3	3											
CO4			3	3					3						
CO5	3	2	3	2				2				3			
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- Quiz
- Assignments
- Question and answer
- PowerPoint presentation

Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	05	00	00	10
K2	Understand	05	05	00	10
K3	Apply	05	05	00	10
K4	Analyse	00	05	05	10
K5	Evaluate	00	00	00	20
K6	Create	00	00	05	00
Total Marks: 100		15	15	10	60

Assessment table

Assessment Tool	K1, K2	K3
	CO1, CO2	CO3, CO4, CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	05	10
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	20	40
Total Marks: 100		

Special Instructions

None

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CSPCC3004: Lab Design and Analysis of Algorithms

Teaching Scheme		Examination Scheme	
Practical (Hours/Week)	**2**	ISE I (Term Work) (Marks)	**25**
Credits	**1**	ESE (Marks)	**25**

Prerequisite

Basics of Computer & Information Technology: Discrete, Mathematical Structure, Data Structures

Course Outcomes

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

CO1: Design and implement appropriate data structures for computation
CO2: Demonstrate algorithms using the divide-and-conquer approach
CO3: Solve problems using greedy methods.
CO4: Employ dynamic programming techniques.
CO5: Problem solving: Using backtracking techniques

List of the Experiments

#	Title of the Experiments	Skill Level	CO	ISE Marks
1	Recursive and non-recursive algorithms for a specific problem and their complexity measures	S1	CO1	04
2	Implement merge sort using the divide and conquer approach.	S1	CO1	04
3	Write a program for finding an element Using Binary Search.	S1	CO1, CO2	04
4	Write a Program for the Greedy Knapsack problem.	S1	CO3	04
5	Minimal spanning trees using Prim's algorithm.	S2	CO2, CO3	04
6	Minimal spanning trees using Kruskal's algorithm	S2	CO2, CO3	04
7	Find a single-source shortest path for the multistage graph problem	S2	CO2	04
8	Find all pairs of shortest paths for the multistage graph problem.	S2	CO2	04
9	Huffman code problem.	S2	CO2	04
10	Flow shop scheduling or knapsack problem, or 8 Queen problem.	S2	CO3	04

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	2											1	2	
CO2		2	2		3									2	2
CO3		3	3		3									3	3
CO4		3	3		3									3	3
CO5		3	3		3									3	3
1 – High, 2 – Medium, 3 - Low															

Assessment Pattern

Level No.	Skill Level	Term Work	Practical Examination & viva voce
S1	Imitation	5	5
S2	Manipulation	15	15
S3	Precision	5	5
S4	Articulation	0	0
55	Naturalization	0	0
Total Marks: 50		25	25
Preparation (S1)		04	05
Conduct of Experiment (S2)		04	07
Observation and Analysis of Results (S3)		08	05
Record (S2)		03	03
Mini-Project / Presentation/ Viva-Voce (S3)		06	05
Total Marks: 50		25	25

Assessment table

Assessment Tool	S1	S2	S2	S2	S3
	CO1	CO2	CO3	CO4	CO5
Term Work (25 Marks)	05	05	05	05	05
Practical Examination & Viva Voce (25 Marks)	05	05	05	05	05
Total Marks: 50					

Special Instructions

None

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CSPEC3001: Data Mining and Data Warehousing (PE-I)

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

Mathematics, Programming language.

Course description

This course helps the students to understand the overall architecture of a data warehouse and methods for data gathering and data pre-processing using OLAP tools. The different data mining models and techniques, like classification, clustering, and association rule analysis, will be discussed in this course.

Course Outcomes

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

- **CO1:** Discuss Different Techniques to Improve Data Modelling
- **CO2:** Understand the concepts of Data Warehousing and Data Mining Concepts
- **CO3:** Illustrate the Patterns Identified Through Association Rule Mining, Classification, and Clustering
- **CO4:** Apply different classification techniques to different data types.
- **CO5:** Demonstrate the various clustering algorithms.

Detailed Syllabus

UNIT I	**Introduction Data Mining** Data: Data, Information and Knowledge; Attribute Types: Nominal, Binary, Ordinal and Numeric attributes, Discrete versus Continuous Attributes; Introduction to Data Preprocessing, Data Cleaning: Missing values, Noisy data; Data integration: Correlation analysis; transformation: Min-max normalization, z-score normalization and decimal scaling; data reduction: Data Cube Aggregation, Attribute Subset Selection, sampling; and Data Discretization: Binning, Histogram Analysis
UNIT II	**Data Warehouse:** Operational Database Systems and Data Warehouses (OLTP Vs OLAP), A Multidimensional Data Model: Data Cubes, Stars, Snowflakes, and Fact Constellations Schemas; OLAP Operations in the Multidimensional Data Model, Concept Hierarchies, Data Warehouse Architecture, The Process of Data Warehouse Design, A three-tier data warehousing architecture
UNIT III	**Association rule Mining:** Market basket Analysis, Frequent item set, Closed item set, Association Rules, a-priori Algorithm, Generating Association Rules from Frequent Item sets, Improving the Efficiency of a-priori, Mining Frequent Item sets without Candidate Generation: FP Growth Algorithm; Mining Various Kinds of Association Rules: Mining multilevel association rules, constraint-based association rule mining.

UNIT IV	**Classification:** Introduction to Classification and Regression for Predictive Analysis, Decision Tree Induction, Naïve Bayesian classification, Rule-Based Classification: using IF-THEN Rules for Classification, Bayesian Belief Networks, Classification Using Frequent Patterns, Associative Classification, Lazy Learners-k-Nearest Neighbour Classifiers, Prediction – Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor, Ensemble Methods, Bagging, Boosting and Random Forest, Model Section and Evaluation.
UNIT V	**Cluster Analysis:** Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.

Text and Reference Books

- Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2007.
- Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw–Hill Edition, Tenth Reprint 2007.
- Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, "Introduction to Data Mining", Pearson Education, 2007.
- G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, 2006.

Related Resources

- NPTEL course: Data Mining: https://nptel.ac.in/courses/106105174

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	1	3				1		2		2	2	1	
CO2	3	3	1	3				1					2	1	
CO3	3	3	1	3				1	2	2		3	2	1	3
CO4	3	3	1	3				1	2	2		3	2	1	3
CO5	3	3	1	3				1	2	2		3	2	1	3
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- Quiz
- Assignments
- Question and answer
- PowerPoint presentation

Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	00	00	00	10
K2	Understand	10	05	02	15
K3	Apply	05	05	02	15
K4	Analyse	00	05	02	15
K5	Evaluate	00	00	02	05
K6	Create	00	00	02	00
Total Marks: 100		15	15	10	60

Assessment table

Assessment Tool	K1, K2	K3
	CO1, CO2	CO3, CO4, CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	00	15
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	25	35
Total Marks: 100		

Special Instructions

None

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CSPEC3002: Cloud Computing (PE-I)

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

It includes programming, networking, virtualization, databases, and security.

Course description

A cloud computing course typically covers foundational concepts like cloud service models (IaaS, PaaS, SaaS), cloud architecture, deployment strategies, security practices, and hands-on experience with major cloud platforms like AWS, Microsoft Azure, and Google Cloud, allowing students to learn how to manage and utilize cloud infrastructure for various applications and business needs; often including topics like virtual machines, storage services, networking, databases, and application development in the cloud.

Course Outcomes

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

CO6: Identify the appropriate cloud services for a given application
CO7: Assess the comparative advantages and disadvantages of Virtualization technology
CO8: Analyse authentication, confidentiality, and privacy issues in cloud computing
CO9: Identify security implications in cloud computing
CO10: Understand the importance of protocols and standards in management for cloud services

Detailed Syllabus

UNIT I	**Introduction to Cloud Computing** Defining Cloud computing, Characteristics, Components, deployment model, service model, Applications, Benefits of cloud computing, Limitations of cloud computing. Grid Computing, Grid vs Cloud Computing.
UNIT II	**Cloud architecture, Services, and Applications** Exploring cloud computing stack – Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Defining Infrastructure as a Service (IaaS), Defining Software as a Service (SaaS), Defining Platform as a Service (PaaS), Defining Identity as a Service (IDaaS), Defining Compliance as a Service (CaaS).
UNIT III	**Cloud Infrastructure and Virtualization** Hardware and Infrastructure – Clients, Security, Network and Services, use of Virtualization technology, Load Balancing and Virtualization, virtualization benefits, Hypervisors, porting application, defining cloud capacity by defining baselines and Metrics
UNIT IV	**Exploring cloud services** Software as a Service – Overview, advantages, limits, virtualization benefits, examples. Platform as a Service – overview, advantages and functionalities, PaaS application frameworks – Drupal, Long Jump. Case study – Google Apps and Web Services.

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UNIT V	**Cloud Administration and Security Management** Management responsibilities, lifecycle management, cloud management products, and Cloud management standards. Cloud security, data security, Identity and presence protocol standards, Availability management in SaaS, IaaS, PaaS, Access Control, Security Vulnerability, Patch and Configuration Management, Security as a Service of cloud, Future of Security in Cloud computing.

Text and Reference Books

- Barrie Sosinsky, "Cloud Computing Bible", Wiley India Edition.
- Anthony Velte, Toby Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach", Tata McGraw-Hill Edition.

Web Resources

- NPTEL course, Database management system (IITK)
  https://onlinecourses.nptel.ac.in/noc21_cs04/

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	1	2	3					1	2					
CO2	3	1	2	3					1	2					
CO3	2	1	2	3					1	2				2	
CO4	3	1	2	3					1	2					
CO5	1	1	2	3					2	3			3		
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- Quiz
- Assignments
- Question and answer
- PowerPoint presentation

Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	05	00	00	10
K2	Understand	05	05	00	10
K3	Apply	05	05	00	10
K4	Analyse	00	05	05	10
K5	Evaluate	00	00	00	20
K6	Create	00	00	05	00
Total Marks: 100		15	15	10	60

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Assessment table

Assessment Tool	K1, K2	K3
	CO1, CO2	CO3, CO4, CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	05	10
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	20	40
Total Marks: 100		

Special Instructions

None

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CSPEC3003: Image Processing (PE-I)

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

Mathematics, Programming language.

Course description

Images and visual information are integral parts of our daily lives. Digital image processing plays an important role in various practical applications, among them: television, medical imaging modalities such as X-ray or ultrasound, photography, security, astronomy, and remote sensing. This subject will introduce the fundamentals of image processing and manipulation. While image applications will be used for illustrations, the subject emphasizes general principles of image processing rather than specific applications. This subject discusses how computers can process digital images and their basic operations (their basis, implementation, and consequences) in image processing.

Course Outcomes

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

CO1: Describe the theory and algorithms that are widely used in digital image processing
CO2: Discuss Image Enhancement Techniques for Various Noisy Image Sets.
CO3: Compare different image segmentation and compression techniques.
CO4: Develop Solutions Utilizing Morphological Concepts.
CO5: Develop any application using different image processing techniques.

Detailed Syllabus

UNIT I	**Digital Image Fundamentals:** Different Fields Of DIP, The Digitized Image and Its Properties – Image Sampling and Quantization, Image Types, Spatial Intensity and Resolution, Basic Relationship Between Pixels, Mathematical Tools Used In DIP.
UNIT II	**Image Enhancement:** Basic Intensity transformation functions, Histogram processing, smoothing and sharpening filters in spatial and frequency domain, Periodic noise. **Image Restoration and reconstruction**: A model of Image Degradation/ restoration Process, Noise Models, Mean filters, order statistics filters, Adaptive filters, and Notch filters.
UNIT III	**Morphological Image Processing:** Erosion & Dilation, Opening & Closing, Hit or Miss Transformation, Boundary Extraction, Thinning, Thickening, Skeletons, Pruning, Textural segmentation, morphological smoothing.

UNIT IV	**Image Segmentation:** Fundamentals, Point, Line & Edge Detection, Thresholding, basic thresholding, global thresholding, multivariable thresholding, region growing, region splitting, and merging. **Image Compression**: Coding redundancy, measuring image information, fidelity criteria, image compression models, Huffman coding, Arithmetic coding, run length coding, symbol-based coding, bit plane coding, digital image watermarking.
UNIT V	**Object recognition:** Need for object recognition system, automated object recognition system, patterns and pattern class, representation of pattern class, selection of measurement parameters, relationship between image processing and object recognition, approaches to object recognition, Bayes' parametric classification, and Structural method-shape numbers, string matching, Face recognition.

Text and Reference Books

- Digital Image Processing, by Gonzales and Woods, 3rd Edition, Pearson Education
- Digital Image Processing, by S. Jayaraman, S. Esakkirajan, T. Veerakumar, TMH Publication
- Fundamentals of Digital Image Processing, by Anil K. Jain, PHI Pub.
- Image Processing, Analysis and Machine Vision, by Milan Sonka, Vaclav Hlavac, Roger Boyle, Cengage Learning, 3rd Edition

Web Resources

- NPTEL course: Digital Image Processing https://nptel.ac.in/courses/117105079
- Virtual Lab: Image Processing https://cse19-iiith.vlabs.ac.in/List%20of%20experiments.html

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	1					2		2		2	3	2	2
CO2	3	3	1					2		2		2	3	2	2
CO3	3	3	1					2		2		3	3	2	2
CO4	3	3	1					2		2		3	3	2	2
CO5	3	3	1					2		2		3	3	2	2
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- Quiz
- Assignments
- Question and answer
- PowerPoint presentation

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Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	05	00	00	10
K2	Understand	05	05	00	10
K3	Apply	05	05	00	10
K4	Analyse	00	05	05	10
K5	Evaluate	00	00	00	20
K6	Create	00	00	05	00
Total Marks: 100		15	15	10	60

Assessment table

Assessment Tool	K1, K2	K3, K4, K5
	CO1, CO2	CO2, CO3, CO4, CO5
ISE I (15 Marks)	10	5
ISE II (15 Marks)	0	15
ISE III (10 Marks)	5	5
ESE Assessment (60 Marks)	30	30
Total Marks: 100		

Special Instructions

None

CSOEC0030: Behavioural Science

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**2**	ISE I (Marks)	**10**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**10**
Credits	**2**	ESE (Marks)	**30**

Prerequisite

Knowledge of common terminology and basic language.

Course description

This course introduces the fundamental principles of behavioural science, examining how psychological, social, and environmental factors influence human behaviour. Students will learn to apply behavioural science to real-world problems in diverse contexts, including health, public policy, and business, and evaluate the ethical implications of behavioural interventions. The course will also foster critical thinking skills, enabling students to design and evaluate behavioural interventions effectively.

Course Outcomes

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

- **CO1:** Explain and analyse the psychological foundations of individual behaviour, including cognitive processes, emotional influences, and social interactions.
- **CO2:** Evaluate how social and environmental factors shape human actions, understanding the impact of groups, culture, and physical surroundings.
- **CO3:** Apply behavioural science principles to address real-world problems, including designing interventions and conducting ethical research.

Detailed Syllabus

UNIT I	**The Psychology of Behaviour (Foundations)** ➔ **Understanding the Individual:** Introduction to core psychological theories; cognitive, social, and developmental. How we perceive, think, and make decisions. The role of motivation and emotion in driving behaviour. Exploration of key psychological areas: perception, memory, thinking, lifespan development, and mental health. Factors that influence human actions: biological, psychological, and social. How behaviours change. ➔ **Social Interactions:** The dynamics of communication and relationships. Understanding group behaviour and teamwork. Social influence, conformity, and how they shape our actions.
UNIT II	**Social and Environmental Influences on Behaviour** ➔ **Social Psychology:** The Power of the Group; Social influence, conformity, and obedience. Group dynamics, social norms, and cultural impacts. Attitudes, beliefs, and prejudice. Sociology: Society's Impact; How social structures influence behaviour. Social groups, institutions, and socialization. Cultural norms, values, and social change. ➔ **Environmental Psychology:** Our Surroundings Matter; The relationship between people and their physical environment. What environmental factors like urban design and climate change affect behaviour. Sustainability and pro-environmental behaviour. Personal space.

UNIT III	**Applying Behavioural Science to Real-World Challenges** ➔ **Behavioural Health:** Promoting Well-being: Using behavioural principles to improve health. Health behaviour changes models (e.g., Health Belief Model). Interventions for health behaviours (e.g., smoking cessation, healthy eating). Behavioural Insights in Public Policy: Designing Effective Public Policies Using Behavioural Science. Applications in education, finance, and environmental protection. Ethical considerations of behavioural interventions. ➔ **Research Methods:** Studying Behaviour Scientifically: Overview of research designs (experiments, surveys, observational studies). Ethical considerations in behavioural research. Introduction to data analysis and interpretation. Scientific inquiry, data collection, and analysis.

Text and Reference Books

- ➔ Behavioural Sciences (Psychology & Sociology), Dr. Victor Devasirvadam, Selvan M. R., Thakur Publication Pvt. Ltd. January 2020.
- ➔ Textbook of Psychology and Behavioural Science, Dr. Vidya Bhagat, Global Vision Publishing House; First Edition, January 2017.
- ➔ Tests, Measurements and Research in Behavioural Sciences, A.K. Singh, Bharati Bhavan, 2019
- ➔ Research Methodology in Behavioural Sciences, S.K. Mangal, PHI Learning Private Limited. 2013.

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1					1		1	2				1			2
CO2					1		1	2				1			2
CO3					1		1	2				2			2
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ESE
K1	Remember	2	2	10
K2	Understand	3	3	10
K3	Apply	5	5	10
Total Marks: 50		10	10	30

Special Instructions

None

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CSPEC3004: Lab Data Mining and Data Warehousing (PE-I)

Teaching Scheme		Examination Scheme	
Practical (Hours/Week)	**2**	ISE I (Term Work) (Marks)	**25**
Credits	**1**	ESE (Marks)	**25**

Course Outcomes

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

CO1: Learn to perform data mining tasks using a data mining toolkit (such as open-source WEKA).

CO2: Understand the data sets and data preprocessing.

CO3: Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification, clustering, and regression.

CO4: Exercise the data mining techniques with varied input values for different parameters.

List of the Experiments

#	Title of the Experiments	Skill Level	CO	ISE Marks
Level: Basic (all)				
1	Install WEKA TOOL	S1	CO1	02
2	Demonstrate the use of ARFF files, taking input and displaying the output of the files.	S2	CO2	02
3	Create your own Excel file. Convert the Excel file to .csv format and prepare it as ARFF files.	S2	CO2	02
4	Preprocess and classify the IRIS dataset.	S2	CO1	03
5	Perform Preprocessing and classification techniques on the agriculture dataset.	S2	CO2	03
Level: Moderate (all)				
6	Preprocess and classify the Weather dataset.	S2	CO3	02
7	Perform the Clustering technique on the Weather dataset	S2	CO4	02
8	Perform the Association technique on the Customer dataset.	S2	CO3	02
9	Perform Naïve Bayes Classification.	S2	CO3	02
Level: Complex (all)				
10	Compare various Data Mining techniques available in WEKA	S3	CO4	03
11	Apply filters to the database and see performance	S2	CO4	02

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Teacher's Assessment:
ISEI: In-Semester Evaluation of 25 marks based on the performance of students in practical hours, practical assignments completed, and timely submission.

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	1	1	3	2		1	2	1	3		3	3	2	3
CO2	2	3	1	3	2		1	2	1	3		3	3	2	3
CO3	3	3	1	3	2		1	2	1	3		3	3	2	3
CO4	3	3	1	3	2		1	2	1	3		3	3	2	3
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Skill Level	ISE I	ESE
S1	Imitation	5	3
S2	Manipulation	17	19
S3	Precision	3	3
S4	Articulation	0	0
55	Naturalization	0	0
Total Marks: 50		25	25

Assessment table

Assessment Tool	S1	S2, S3
	CO1	CO2, CO3, CO4
Term Work (25 Marks)	5	20
Practical Examination & Viva Voce (25 Marks)	3	22
Total Marks: 50		

Special Instructions
None

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CSPEC3005: Lab Cloud Computing (PE-I)

Teaching Scheme		Examination Scheme	
Practical (Hours/Week)	**2**	ISE I (Term Work) (Marks)	**25**
Credits	**1**	ESE (Marks)	**25**

Course Outcomes

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

CO1: Create Virtual Machine images and deploy them on the Cloud.
CO2: Characterize the performance of cloud equipment.
CO3: Installation of Cloud.
CO4: Exercise the data mining techniques with varied input values for different parameters.
CO5: Develop an understanding of economic issues related to cloud

List of the Experiments

#	Title of the Experiments	Skill Level	CO	ISE Marks
Level: Basic (all)				
1	Introduction to cloud computing.	S1	CO1	4
2	Implementation of SOAP Web services in C#/JAVA Applications.	S2	CO2	4
3	Implementation of RESTful Web services in C#/JAVA Applications.	S2	CO2	5
4	Implementation of Para-Virtualization using VMware's Workstation/ Oracle's Virtual Box and Guest OS	S2	CO1	5
5	Implementation of Full-Virtualization using VMware's ESXi and Guest OS.	S2	CO2	5
6	Creating a Warehouse Application in SalesForce.com.	S3	CO5	6
7	Installation and Configuration of Single-Node Setup in Hadoop.	S3	CO4	4
8	Create any Application (Ex, Word Count) Using Hadoop Map/Reduce.	S3	CO5	5
9	To study Cloud security challenges.	S1	CO1	4
10	Case Study: PAAS (Facebook, Google App Engine)	S1	CO1	4
11	Case Study: Amazon Web Services	S2	CO3	4

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Teacher's Assessment:
ISEI: In-Semester Evaluation of 25 marks based on the performance of students in practical hours, practical assignments completed, and timely submission.

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	1	1	3	2			2	1	3		3	2	1	
CO2	2	3	1	3	2			2	1	3		3	2	1	
CO3	3	3	1	2	1			1	1	1		3	2	1	
CO4	3	3	1	2	1			1	1	1	2	3	1	1	
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Skill Level	ESE
S1	Imitation	3
S2	Manipulation	19
S3	Precision	3
S4	Articulation	0
55	Naturalization	0
Total Marks: 25		25

Assessment table

Assessment Tool	S1	S2, S3
	CO1	CO2, CO3, CO4
ESE (25 Marks)	3	22
Total Marks: 25		

Special Instructions
None

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CSPEC3006: Lab Image Processing (PE-I)

Teaching Scheme		Examination Scheme	
Practical (Hours/Week)	**2**	ISE I (Term Work) (Marks)	**25**
Credits	**1**	ESE (Marks)	**25**

Course Outcomes

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

CO1: Perform image-related operations.
CO2: Apply a proper filter to a set of noisy images.
CO3: Analyse different image segmentation and compression techniques.
CO4: Demonstrate different morphological operations.
CO5: Develop any application using different image processing techniques.

List of the Experiments

#	Title of the Experiments	Skill Level	CO	ISE Marks
	Level: Basic (all)			
1	To study the MATLAB toolbox.	S1	CO1	02
2	To perform simple arithmetic operations on images.	S2	CO2	02
3	To implement a program for image enhancement using histogram equalization.	S2	CO2	02
4	To study and implement the program addition of different types of noise to images.	S2	CO2	03
5	To study and implement a program of low-pass and high-pass filters using Gaussian filters.	S2	CO2	03
	Level: Moderate (all)			
6	To implement a program of edge detection using different types of methods	S3	CO3	02
7	To implement a program to perform different morphological operations on images and reduce noise using morphological operations in images.	S3	CO4	02
8	To study and implement a program of the different types of texture effects on images.	S2	CO4	02
9	To study and implement a program to detect a cell using image segmentation.	S3	CO3	02
	Level: Complex (all)			
10	To study and implement the program of bit plane coding.	S3	CO3	02
11	To study and implement wavelet-based watermarking.	S3	CO5	03

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Teacher's Assessment:
ISEI: In-Semester Evaluation of 25 marks based on the performance of students in practical hours, practical assignments completed, and timely submission.

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	1	3				2	1	2		3	2	1	2
CO2	3	3	1	3				2	1	2		3	2	1	2
CO3	3	3	1	3				2	1	2		3	2	1	2
CO4	3	3	1	3				2	1	2		3	2	1	2
CO5	3	3	1	3				2	1	2		3	2	1	2
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Skill Level	ISE I	ESE
S1	Imitation	2	2
S2	Manipulation	12	12
S3	Precision	11	11
S4	Articulation	0	0
55	Naturalization	0	0
Total Marks: 50		25	25

Assessment table

Assessment Tool	S1	S2, S3
	CO1	CO2, CO3, CO4, CO5
Term Work (25 Marks)	2	23
Practical Examination & Viva Voce (25 Marks)	2	23
Total Marks: 50		

Special Instructions
None

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Dated: 25th March 2025

CSPCC3005: Computer Network

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

Basics of Computer & Information Technology

Course description

This course introduces the architecture, functions, components, and models of computer networks and the Internet. The principles of IP addressing and fundamentals of Ethernet concepts, media, and operations are introduced. Students will be able to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes.

Course Outcomes

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

CO1: Various protocols, models in Networks.
CO2: Comprehend Network hardware, Media Types (cables, Wireless).
CO3: Compare UTP, Connectors, and Network Interface Card.
CO4: Design, implement, and analyse simple computer networks.
CO5: Apply the different strategies of TCP/UDP, FTP, HTTP, SMTP, and SNMP.

Detailed Syllabus

UNIT I	**Introduction to Network** Overview of computer network, Network hardware and software, Reference model- OSI and TCP/IP and their comparison, Network layer- Network layer design issues, various routing Algorithms and congestion control algorithms
UNIT II	**TCP/IP Architecture** TCP/IP architecture, the internet protocols, IPv4, IPv6, DHCP, and Mobile IP, IP addressing, OSPF and BGP, multicast routing, and the network layer in ATM networks
UNIT III	**Transport layer** The transport services, elements of transport protocols, internet, Transport protocols, ATM –AAL layer protocols, Performance issues.
UNIT IV	**The Application layer** Network security – principle of cryptography, secret key and public key algorithm, digital signature, Domain name system-The DNS name space, resource records, name server, Simple Network Management Protocol –SNMP model, electronic mail- architecture and services, Message formats and message transfer, email privacy.
UNIT V	**Multimedia Information and Networking** Lossless data compression, Compression of Analog Signals, Video on Demand, Image and Video Coding, ATM Layer, Transmission in ATM network, Communication satellites.

Text and Reference Books

- Andrew S. Tenenbaum, Computer Networks PHI
- Alberto, Leon Garcia, and Indra Widjaja, Communication networks- Fundamental concepts and key architectures, Tata McGraw-Hill

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	1						1				2		
CO2		2	1						1				2		
CO3		2	1						1				2		1
CO4		2	2						2			1	3		1
CO5	1	1	1						1			1	2		1
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

Teachers' Assessment of 10 marks is based on one / or a combination of the following

- Tutorials
- Problem Solving
- PowerPoint presentation of case studies
- Question & answer / Numerical solution

Assessment Pattern

Level No.	Knowledge Level	ISE I & ISE II	ISE III	ESE
K1	Remember	15	5	15
K2	Understand	15	00	20
K3	Apply	00	5	25
K4	Analyse	00	00	00
K5	Evaluate	00	00	00
Total Marks: 100		30	10	60

Assessment table

Assessment Tool	K1	K2	K3	K1	K3
	C01	C02	C03	CO4	CO5
ISE I & II (30 Marks)	15	10	05	00	00
ISE III (10 Marks)	05	00	00	05	00
ESE Assessment (60 Marks)	10	20	10	10	10

Special Instructions

None

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CSPCC3006: Principles of Compiler Design

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

Discrete Mathematical Structure

Course description

This course gives an introduction to system programs and compiler construction. It also gives the knowledge role of a lexical analyser, specification and recognition tokens, Lexical analyser generator LEX, role of a Parser, Types of Parsers. This course also gives an idea about Syntax Directed Translation and Intermediate Code Generation using different techniques such as DAG, three-address code, etc. At the end of this course gives information runtime environment and issues in code generation and code optimization.

Course Outcomes

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

CO1: Enrich the knowledge in various phases of the compiler and its use.
CO2: Describe the use of a lexical & syntax analyser for the generation of tokens & parse trees.
CO3: Develop program constructs using SSDDs& type checkers
CO4: Illustrate and demonstrate code generation techniques for targeted code
CO5: Design a simple compiler with tools & different optimized techniques

Detailed Syllabus

UNIT I	**Introduction to Compiling and Lexical Analysis** System software, Types of System software, Definition, analysis of the source program, the phases of a compiler, the grouping of phases, Compiler Construction tools, A simple one-pass compiler, the role of the Lexical analyser, Input buffering, Specification of Tokens, Regular expressions, A Language for Specifying Lexical Analysers, Lexical Analyzer generator. (Lex)
UNIT II	**Syntax Analysis** The role of the Parser, Context-free grammars, writing a Grammar, Top-Down Parsing, Bottom-Up Parsing, Operator-precedence Parsing, LR-Parsers, Using Ambiguous Grammars, Parser Generators (YACC)
UNIT III	**Syntax-Directed Translation** Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of Attributed Definitions, Top-Down Translation, Bottom-Up Evaluation of Inherited S Attributes. Type Checkers: type checking for expressions, declarations (variable, type, function, recursive), statements,
UNIT IV	**Intermediate Code Generation** Intermediate forms of source programs– abstract syntax tree, polish notation, and three-address code, types of three-address statements and their implementation, syntax-directed translation into three-address code, translation of simple statements.

UNIT V	**Code Generation & Code Optimization** Issues in the Design of a Code Generator, the target Machine, Run-Time Storage Management, Basic Blocks and Flow Graphs, Simple Code Generator, register allocation and Assignment, The DAG Representation of Basic Blocks, Generating Code from DAGs, Peephole Optimization, Principal sources of optimization.

Text and Reference Books

- Alfred V. Abo Columbia University, Monica S. Lam, Stanford University, Ravi Sethi, Avaya, Jeffrey D. Ullman, Stanford University," Compilers: Principles, Techniques and Tools",2nd edition, Pearson
- Dick Grune, Kees van Reeuwijk, Henri E. Bal, Ceriel J.H. Jacobs, and Koen Langendoen. 2012. Modern Compiler Design (2nd. ed.). Springer Publishing Company, Incorporated. Paul G. Sorenson, Compiler Writing, McGraw-Hill Publication.
- Hunter, The Essence of Compilers, Pearson Publication.
- Lewis, Elements of the Theory of Computation, Pearson Publication.
- Jean Paul Tremblay, Paul Gordon Sorenson, Theory and Practice of Compiler Writing, BS Publications, 2008

Related Course

- https://nptel.ac.in/courses/106105190

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2											2	1	
CO2	3	3	1										2	1	
CO3	3	3	1										2	1	
CO4	3	3	2									1	2	1	
CO5		3	3									1	1	1	1
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- Quiz
- Assignments
- Question and answer
- PowerPoint presentation

Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	05	05	02	10
K2	Understand	05	05	02	10
K3	Apply	05	05	02	20
K4	Analyse	00	00	02	10
K5	Evaluate	00	00	00	00
K6	Create	00	00	02	10
Total Marks: 100		15	15	10	60

Assessment table

Assessment Tool	K1, K2	K3, K4, K6
	CO1, CO2	CO2, CO3, CO4, CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	10	05
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	30	30
Total Marks: 100		

Special Instructions

None

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CSPEC3007: Machine Learning (PE-II)

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

Mathematics, Data warehousing and mining, Programming language.

Course description

Machine learning is concerned with the question of how to make computers learn from experience. Machine learning techniques are used to create spam filters, to analyse customer purchase data, to understand natural language, or to detect fraudulent credit card transactions. This course will introduce the fundamental set of techniques and algorithms that constitute machine learning as of today, ranging from classification methods like decision trees and support vector machines, to structured models like hidden Markov models, to clustering and matrix factorization methods for recommendation.

Course Outcomes

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

CO1: Understand the learning models.
CO2: Describe the working of different algorithms like HMM, probabilistic models.
CO3: Apply regression to different application areas.
CO4: Illustrate Feature selection and reduction methods.
CO5: Describe the multiple criteria for analysing RL algorithms.

Detailed Syllabus

UNIT I	Algorithmic models of learning. Learning classifiers, functions, relations, grammars, probabilistic models, value functions, behaviours, and programs from experience. Bayesian, maximum a posteriori, and minimum description length frameworks, Evaluation, Cross validation.
UNIT II	Parameter estimation, sufficient statistics, decision trees, neural networks, support vector machines, Bayesian networks, bag of words classifiers, N-gram models, Markov and Hidden Markov models, probabilistic relational models, association rules, nearest neighbour classifiers, overfitting
UNIT III	Overview of statistical linear models, Linear Regression, Multivariate Regression, Subset Selection, Shrinkage Methods, Principal Component Regression, Partial Least Squares, Linear Classification, Logistic Regression, Linear Discriminant Analysis. Gaussian Mixture Models, Expectation Maximization
UNIT IV	Computational learning theory, mistake bound analysis, sample complexity analysis, VC dimension, Occam learning, accuracy, and confidence boosting. Dimensionality reduction, feature selection, and visualization. Clustering, mixture models, k-means clustering, hierarchical clustering, distributional clustering.

UNIT V	Reinforcement learning: Learning from heterogeneous, distributed data and knowledge. Learning Theory, Introduction to Reinforcement Learning, Optional videos (RL framework, TD learning, Solution Methods, Applications, functional approximation, policy search, exploration, exploitation, Imitation Learning, policy iteration, value iteration, Q learning.

Text and Reference Books

- Bishop, C., Pattern Recognition and Machine Learning, Berlin: Springer-Verlag, 2006.
- Tom Mitchell, Machine Learning, McGraw-Hill, 1997.
- Hastie, Tibshirani, Friedman, The Elements of Statistical Learning, Springer, 2001.
- Sergios, Theodoridis, Konstantinos, Koutroumbas, Pattern Recognition, Academic Press, 2009.
- Ethem Alpaydin, "Introduction to machine learning", second edition, PHI publication, 2010.
- Marco Wiering, Martijn Otterlo, Reinforcement Learning State-of-the-Art, ISBN: 978-3-642-27645-3
- Darren Cook, Practical Machine Learning with H2O, O'Reilly, 2017

Related Resources

- E Books: 1. Charu C. Aggarwal, Chandan K. Reddy, "Data Clustering Algorithms and Applications", CRC Press
- https://onlinecourses.nptel.ac.in/noc22_cs29/preview

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	1	3				1	2	3		2		1	
CO2	3	3	1	2				1	2	3		2		1	
CO3	3	3	1	3				1	2	3		2	2	1	3
CO4	2	3	1	3				1	2	3		3	2	1	3
CO5	2	3	1	3				1	2	3		3	2	1	3
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- Quiz
- Assignments
- Question and answer
- PowerPoint presentation

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Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	00	00	00	10
K2	Understand	10	05	02	15
K3	Apply	05	05	02	15
K4	Analyse	00	05	02	15
K5	Evaluate	00	00	02	05
K6	Create	00	00	02	00
Total Marks: 100		15	15	10	60

Assessment table

Assessment Tool	K1, K2	K3, K4, K6
	CO1, CO2	CO2, CO3, CO4, CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	00	15
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	30	30
Total Marks: 100		

Special Instructions

None

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CSPEC3008: Computer Vision (PE-II)

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

Image processing, Programming, Mathematics

Course description

This subject focuses on enabling computers to identify and understand objects and people in images and videos by using an algorithm to extract meaningful information. This requires understanding the fundamental concepts related to pattern analysis, image formation, camera imaging geometry, feature detection, extraction, and matching, stereo, motion estimation and tracking, image classification, and scene understanding. Applications range from Biometrics, Medical diagnosis, document processing, mining of visual content, to surveillance, advanced rendering, etc.

Course Outcomes

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

- **CO1:** Describe image representation, its mathematical representation, and different transformation backgrounds.
- **CO2:** Understand the image formation and different data structures
- **CO3:** Use different segmentation models to classify the given input and recognize the pattern using algorithms.
- **CO4:** Construct a 3D object from a given set of images.
- **CO5:** Detect a moving object in a video using the concept of motion analysis.

Detailed Syllabus

UNIT I	**Digital Image Formation and low-level processing**: Image representations, a few concepts, Image digitization, Digital image properties, Colour images. Images as stochastic processes, Image formation physics. **Transformation Background**: Linear integral transforms, Orthogonal, Euclidean Image Enhancement, Restoration, Histogram Processing
UNIT II	**Image Formation:** Geometric primitives and transformation, photometric image formation, the digital camera. **Data structures for image analysis:** levels of image data representation, traditional image data structures, and Hierarchical data structures. Image understanding-fitting via random sample consensus, point distribution model.
UNIT III	**Image Segmentation:** Region Growing, Edge-Based approaches to segmentation, Object detection. Mean Shift Segmentation MRFs, Active contour models – snakes, 3D graph–based image segmentation, Graph cut segmentation. **Pattern Analysis**: Clustering: K-Means, K-Medoids, Mixture of Gaussians

UNIT IV	**3D Transformation:** Vision tasks, basics of projective geometry, A Single perspective camera, Scene reconstruction from multiple views, two camera stereopsis, 3D Reconstruction**:** Shape from X, Full 3D objects, 3D model-based vision, 2D view-based representations of a 3D scene.
UNIT V	**Motion Analysis:** Time difference, Background subtraction and modelling, Optical flow, Detection of specific motion patterns, Dynamic Stereo, video tracking, **Human Analysis:** pose estimation, facial analysis, attribute recognition.

Text and Reference Books

- "Computer Vision: A Modern Approach", David A. Forsyth (Author), Jean Pons,2nd edition, 2015, Publisher: Pearson Education
- "Digital Image Processing and Computer Vision", Milan Sonka, Vaclav Hlavac, Roger Boyle, Cengage Learning, 1st Edition, 2008.
- "Computer Vision Algorithms and Applications," Richard Szeliski, Available for free online.
- "Computer Vision: Models, Learning, and Inference", Simon J.D. Prince, ISBN 13: 978-1107011793, ISBN-10: 1107011795

Related Resources

- NPTEL Course: https://onlinecourses.nptel.ac.in/noc19_cs58/preview
- NPTEL Course: Computer Vision and Image Processing - Fundamentals and Applications - Course (nptel.ac.in)

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3						2					2	2	
CO2	2	3						2		2			3	2	
CO3	2	3						2		2			3	1	
CO4	2	2			1			2	1	2			1	1	1
CO5	1	2			1			2	1	2		2	1	2	1
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- Quiz
- Assignments
- Question and answer
- PowerPoint presentation

Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	00	00	00	10
K2	Understand	10	05	02	15
K3	Apply	05	05	02	15
K4	Analyse	00	05	02	15
K5	Evaluate	00	00	02	05
K6	Create	00	00	02	00
Total Marks: 100		15	15	10	60

Assessment table

Assessment Tool	K1, K2	K3
	CO1, CO2	CO2, CO3, CO4, CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	05	10
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	30	30
Total Marks: 100		

Special Instructions

None

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CSPEC3009: Software Testing and Quality Assurance (PE-II)

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

Principles of Software Engineering

Course description

A "Software Testing and Quality Assurance" course typically covers the methodologies, techniques, and processes involved in ensuring the quality of software by systematically testing its functionalities, identifying defects, and verifying that it meets specified requirements throughout the development lifecycle, including topics like test case design, different testing types (functional, performance, regression), test automation, defect management, and quality assurance metrics, often incorporating hands-on practice with real-world scenarios.

Course Outcomes

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

- **CO1:** Formulate the problem by following the Software Testing Life Cycle
- **CO2:** Design Manual Test Cases for Software Project
- **CO3:** Identify the realistic problems for different categories of software
- **CO4:** By using an automation testing tool, students will be able to test the software
- **CO5:** Follow the process-related activity and testing techniques to work as a team member

Detailed Syllabus

UNIT I	**Introduction:** *s/w testing background* – What is a bug? Why do bugs occur? The cost of bugs. Goals of a software tester. Characteristics of s/w tester. *Software development process* – product component, software project staff, software development lifecycle model. *The realities of s/w testing* – testing axioms, s/w testing terms and definitions, Software Testing Life Cycle (STLC)
UNIT II	**S/w testing fundamentals:** *Examining the specifications* – Black box and white box testing, Static and dynamic testing, Static black box testing, Performing a high-level review of the specification, Low-level specification test techniques. *Testing the s/w with blinders on* – Dynamic black box testing, Test to pass and test to fail, Equivalence partitioning, data testing, State testing, Other black box test techniques. *Examining the code* – Static white box testing, Formal review, Coding standards and guidelines, Generic code review checklist. *Testing the software with X-ray glasses* – Dynamic white box testing, Dynamic white box testing, versus debugging testing the pieces
UNIT III	**Types of testing I:** Configuration testing, Compatibility testing, foreign language testing, Usability testing, Testing the documentation, Testing for software security

UNIT IV	**Types of testing-II:** Website testing, *Automated testing, and test tools* – Benefits of automation and tools, various test tools, Software test automation, Random testing. *Bug bashes and beta testing* – Having other people test your s/w, Test sharing, Beta testing, Outsourcing your testing. **Performance Testing:** Introduction, Benefits of performance testing. Types of performance testing, Tools for performance Testing, Process for performance testing, challenges.
UNIT V	**Test planning and quality assurance:** *Planning the test* – Goal of test planning, Various test planning topics, Writing and tracking test cases, Goal of test case planning, Test case planning overview, Test case organization and tracking. *Reporting what you find* – Getting the bug fixed, Isolating and replacing bugs, Bug's lifecycle, Bug tracking system, Measuring the success. *Software quality assurance* – Quality is free, Testing and quality assurance in the workplace, Test management and organizational structures, Capability Maturity Model (CMM), ISO 9000. *Test Metrics and Measurement* – Test Defect Metrics – Defect find rate, Defect fix rate, outstanding defects rate, priority outstanding rate, Defect trends, Defect classification trend, weighted defects trend, Defect cause distribution. *Productivity Metrics* – Defect per 100 hours of testing, Test Cases Executed per 100 Test Cases, Defects per 100 failed test cases, Test phase Effectiveness, Closed Defect Distribution.

Text and Reference Books

- Ron Patton, "Software Testing," SAMS Publishing
- Marnie L. Hutcheson – "Software Testing Fundamentals: Methods and Metrics" WILEY Pub.
- Pressman, "Software Engineering," McGraw-Hill publications
- Srinivasan Desikan and Gopal Swami Ramesh," Software Testing – Principles and Practices"

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#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	1	2	3					1	2					
CO2	3	1	2	3					1	2					
CO3	2	1	2	3					1	2				2	
CO4	3	1	2	3					1	2					
CO5	1	1	2	3					2	3			3		
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- Quiz
- Assignments
- Question and answer
- PowerPoint presentation

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Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	05	00	00	10
K2	Understand	05	05	00	10
K3	Apply	05	05	00	10
K4	Analyse	00	05	05	10
K5	Evaluate	00	00	00	20
K6	Create	00	00	05	00
Total Marks: 100		15	15	10	60

Assessment table

Assessment Tool	K1, K2	K3
	CO1, CO2	CO2, CO3, CO4, CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	05	10
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	20	40
Total Marks: 100		

Special Instructions

None

CSPEC3010: Natural Language Processing (PE-III)

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite
Compiler Design

Course description
This course teaches the students the leading trends and systems in natural language processing & makes them understand the concepts of morphology, syntax, semantics, and pragmatics of the language. It also describes the application based on natural language processing and shows the points of syntactic, semantic processing.

Course Outcomes
After successful completion of the course, students will be able to:

- **CO1:** Understand the fundamental concepts of Natural Language Processing (NLP), including text processing techniques such as tokenization, stemming, and lemmatization.
- **CO2:** Apply linguistic principles like morphology, syntax, and semantics to analyse and process text data efficiently.
- **CO3:** Apply various text representation techniques, including Bag of Words (BoW), TF-IDF, and word embeddings such as Word2Vec and GloVe.
- **CO4:** Design text classification models using machine learning and deep learning approaches for sentiment analysis, spam detection, and categorization tasks.
- **CO5:** Discuss AI models and chatbots using NLP frameworks and pre-trained language models like BERT.

Detailed Syllabus

UNIT I	**Overview of Natural Language Processing (NLP) and its applications in AI.** *Understanding linguistic fundamentals:* syntax, semantics, morphology, and phonetics. Tokenization, stemming, and lemmatization. *Text Preprocessing and Feature Extraction:* Techniques for cleaning and preprocessing textual data, Feature extraction methods for representing text data, including bag-of-words and TF-IDF. *Introduction to popular NLP libraries:* NLTK, spaCy, Hugging Face, Transformers.
UNIT II	**Word Level Analysis:** Unsmoothed n-grams, evaluating n-grams, smoothing part-of-speech tagging, rule-based, stochastic, and transformation-based tagging, issues in pos tagging – Hidden Markov and maximum entropy models, Parsing, Regular Expressions for Text Processing
UNIT III	**Text Representation Techniques:** Bag of Words (BoW), Term Frequency-Inverse Document Frequency (TF-IDF), Word Embeddings: Word2Vec, GloVe, FastText. Sentiment analysis, named entity recognition, and part-of-speech tagging.

UNIT IV	**Text Classification:** Supervised vs. Unsupervised Learning in NLP, Naïve Bayes, Logistic Regression, and SVM for Text Classification, News categorization and summarization, topic modelling, Latent Dirichlet Allocation
UNIT V	**Introduction to Large Language Models (LLM):** Overview of large language models such as GPT (Generative Pre-trained Transformer) and BERT (Bidirectional Encoder Representations from Transformers). Pre-training Language Models: Understanding the pre-training process for language models, Exploration of model architectures, and training strategies.

Text and Reference Books

- Jurafsky, Daniel, and James H. Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Speech Recognition, and Computational Linguistics, Prentice Hall, 2000.
- Christopher D. Manning and Hinrich Schütze, Foundations of Statistical Natural Language Processing. Cambridge, MIT Press, 1999.
- James Allen, Natural Language Understanding, Benjamin/Cummings, 2nd ed., 1995.
- Eugene Charniak, Statistical Language Learning, MIT Press, 1996.
- P. Lieberman, Toward an evolutionary biology of language, Harvard University Press, 2006.
- Denis Rothman, Transformers for Natural Language Processing: Build innovative deep neural network architectures for NLP with Python, PyTorch, TensorFlow, BERT, RoBERTa

Related Resources

- https://nptel.ac.in/courses/106105158
- https://nptel.ac.in/courses/106106211
- https://nptel.ac.in/courses/106101007

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2												1	1	
CO2	2									2			1	1	
CO3	3	3								2		2	1	1	1
CO4	3	3								2		2	1	1	1
CO5	3	3								2		2	1	1	1
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- Quiz
- Assignments
- Question and answer
- PowerPoint presentation

Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	05	00	02	10
K2	Understand	05	05	02	20
K3	Apply	05	05	03	20
K4	Analyse	00	05	03	10
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks: 100		15	15	10	60

Assessment table

Assessment Tool	K1, K2	K3, K4
	CO1	CO2, CO3, CO4, CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	10	05
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	30	30
Total Marks: 100		

Special Instructions

None

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Dated: 25th March 2025

CSPEC3011: Neural Network (PE-III)

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

None

Course description

This course provides a comprehensive understanding of Neural Networks, covering their fundamental concepts, architectures, and applications. Students will learn about perceptron, multi-layer networks, activation functions, and training algorithms such as backpropagation. The course will also explore techniques for improving neural network performance, including weight regularization, optimization methods, and generalization strategies. By engaging in practical implementations, students will develop skills to design, train, and evaluate neural networks for solving real-world problems.

Course Outcomes

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

- **CO1:** Differentiate between various neural network architectures and their computational properties.
- **CO2:** Identify real-world problems where neural networks can be effectively applied.
- **CO3:** Design and implement feedforward and recurrent neural networks using suitable algorithms and frameworks.
- **CO4:** Analyse and evaluate neural network models based on performance metrics and optimization techniques.
- **CO5:** Explore research opportunities in neural networks and prepare for advanced studies in AI and machine learning

Detailed Syllabus

UNIT I	**Neural Network:** Introduction to Neural Networks, History of Neural Networks, Perceptron and Classification, Linear Models (Regression), Activation Functions and Error Functions, Backpropagation Algorithm, gradient descent optimization – stochastic gradient descent.
UNIT II	**Neural Network Structures Introduction:** Network Architecture, Threshold Logic Units (TLU), Decision Surface. Hebbian Learning and LMS Algorithms.
UNIT III	**Recurrent Network, Model sequencing:** Introduction to Recurrent Neural Networks, Modelling Sequences with RNNs, Training RNNs with Backpropagation Through Time (BPTT), Challenges in Training RNNs, Long Short-Term Memory (LSTM) Networks, Echo State Networks, Hessian-Free Optimization, Learning to Predict Sequences and Next-Character Prediction

UNIT IV	**Probabilistic Neural Network:** Network Introduction to Probabilistic Neural Networks, Boltzmann Machines and Restricted Boltzmann Machines (RBMs), Sigmoid Belief Networks, Generative Models in Neural Networks.
UNIT V	**Application Domains:** Object Recognition, Language Processing, Speech Recognition. Cognitive Aspects of Neural Networks: Concept and Word Learning (Eliana Colunga's Research) Limitations of Deep Learning and Future Directions

Text Books

- Neural Network and Deep Learning – Michael Nielsen
- Martin T. Hagan, Howard B. Demuth, Mark H. Beale, Neural Network Design
- Neural Networks and Learning Machines – Simon Haykin.
- James A. Anderson, An Introduction to Neural Networks, MIT Press
- Fundamentals of Neural Networks: Architectures, Algorithms, and Applications – Laurene Fausett.
- Introduction to Artificial Neural Networks – S. N. Sivananda, S. Sumathi, and S. N. Deepa.

Reference Books

- Neural Network and Deep Learning – Michael Nielsen
- Martin T. Hagan, Howard B. Demuth, Mark H. Beale, Neural Network Design, (3) Neural Networks and Learning Machines – Simon Haykin.

Related NPTEL Courses

- https://nptel.ac.in/courses/117105084
- https://archive.nptel.ac.in/courses/117/105/117105084/

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3											1	3		
CO2	1														
CO3	2	2	1										2		
CO4	3	1	2		1				2	1			1	1	
CO5	3	1			1				1	1		1	1	1	1
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- Quiz
- Assignments
- Question and answer
- PowerPoint presentation

Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	00	00	00	10
K2	Understand	10	10	05	20
K3	Apply	05	05	05	30
K4	Analyse	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks: 100		15	15	10	60

Assessment table

Assessment Tool	K1, K2	K3, K4
	CO1	CO2, CO3, CO4, CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	10	05
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	30	30
Total Marks: 100		

Special Instructions

None

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CSPEC3012: Cryptography and Network Security (PE-III)

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

None

Course description

This course will introduce the concepts of Cryptography and Network Security. The course begins with basic cryptographic algorithms and extends to the advanced ones with symmetric and asymmetric cipher cryptography algorithms. Several standards and frameworks like Kerberos, X.509, Pretty Good Privacy, etc., are included. Some basic insights into firewalls, intrusion detection, and cloud security are also a part of this course.

Course Outcomes

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

- **CO1:** To provide a deeper understanding of cryptography, its application to network security, threats/vulnerabilities to networks, and countermeasures.
- **CO2:** To apply the knowledge of public key cryptography systems.
- **CO3:** To familiarize Digital Signature Standard and provide solutions for their issues.
- **CO4:** To showcase IP Security Architecture & Transport Layer Security to identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks.
- **CO5:** To explain the firewall design principles and various intrusion detection systems.

Detailed Syllabus

UNIT I	**Overview:** Computer Security Concepts, Security Attacks, Security Services, Security Mechanism, A Model for Network Security, Symmetric Ciphers: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography, Block Ciphers and Data Encryption, Euclid's Algorithm, Traffic Confidentiality, key distribution.
UNIT II	**Public Key Crypto System and RSA:** Prime Numbers, Fermat's and Euler's Theorems, Principles of Public-Key Cryptography, the RSA Algorithm, Key Management, Diffie-Hellman Key Exchange, Cryptographic Hash Function: Applications, Requirements & Security, SHA-3, Authentication Functions.
UNIT III	**Digital Signatures:** Digital Signature Standards. Authentication Application & Kerberos, X.509 Authentication Service. **Email Security:** Pretty Good Privacy, S/MIME. Elliptic curve-based cryptography.
UNIT IV	**IP Security and Web Security:** IP Security overview, IP Security Architecture, Authentication Header, IP Security Policy, Encapsulating Security Payload, Transport Level Security, Wireless Network Security

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UNIT V	**System Security:** Intruders, Intrusion Detection, Firewalls, Firewall Design Principles. **Cloud Security:** Threats in cloud security, Cloud Security Controls. **Mobile Security:** Challenges, Attacks based on Communication, vulnerabilities in Text Software application, Countermeasures

Text Books

- William Stallings, "Cryptography and Network Security: Principles & Practice", Pearson Education
- Atul khanate, "Cryptography and Network Security", Mc Graw Hill Education. 3. William Stallings (2000), Network Security Essentials (Applications and Standards), Pearson Education, India.

Reference Books

- Neural Network and Deep Learning – Michael Nielsen
- Martin T. Hagan, Howard B. Demuth, Mark H. Beale, Neural Network Design, (3) Neural Networks and Learning Machines – Simon Haykin.

Related NPTEL Courses

- Cryptography and network security (IITK): Cryptography and Network Security at nptel.ac.in.

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	1	2								2				
CO2	1	1	2								2				
CO3	3	2	3	3										2	
CO4	3	2	3												
CO5	3	2	3	2				2			2		3		
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- Quiz
- Assignments
- Question and answer
- PowerPoint presentation

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Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	05	00	00	10
K2	Understand	05	05	00	10
K3	Apply	05	05	00	10
K4	Analyse	00	05	05	10
K5	Evaluate	00	00	00	20
K6	Create	00	00	05	00
Total Marks: 100		15	15	10	60

Assessment table

Assessment Tool	K1, K2	K3
	CO1, CO2	CO3, CO4, CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	05	10
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	20	40
Total Marks: 100		

Special Instructions

None

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CSPCC3007: Lab Computer Network

Teaching Scheme		Examination Scheme	
Practical (Hours/Week)	**2**	ISE I (Term Work) (Marks)	**25**
Credits	**1**	ESE (Marks)	**25**

Prerequisite

Basics of Computer & Information Technology

Course Outcomes

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

CO1: Recognize the different internetworking devices and their functions.

CO2: Role of protocols in networking.

CO3: Design and apply subnet masks and addresses to fulfil networking requirements.

CO4: Features of TCP/IP Protocol

CO5: Analyse the features and operations of various application layer protocols such as HTTP, DNS.

List of the Experiments

#	Title of the Experiments	Skill Level	CO	ISE Marks
1	Introduction to Networking Devices	S1	CO1	4
2	Understanding/illustrating the network features of to peer-to-peer network	S2	CO1	4
3	Understanding / Illustrating the network features of a Client-Server network.	S2	CO1	5
4	Build a Category 5 or Category 6 Unshielded Twisted Pair (UTP) Ethernet crossover cable	S2	CO3	5
5	Connecting 2 Computers using a Crossover cable	S2	CO3	5
6	Configure TCP/IP in the LAN	S3	CO5	5
7	File Transfer / Sharing/ Virtual Desktop Access	S2	CO3	5
8	Study of basic network commands and Network configuration commands.	S1	CO1	5
9	A program for a simple RSA algorithm to encrypt and decrypt the data.	S2	CO2	6
10	Client/Server chat application	S3	CO5	6

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2								1		1	3	2	
CO2		2	2		3					1		1		2	2
CO3		3	3		3					1		1		3	3
CO4		3	3		3					1		1		3	3
CO5		3	3		3									3	3
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Skill Level	Term Work	Practical Examination & viva voce
S1	Imitation	5	5
S2	Manipulation	15	15
S3	Precision	5	5
S4	Articulation	0	0
55	Naturalization	0	0
Total Marks: 50		25	25
Preparation (S1)		04	05
Conduct of Experiment (S2)		04	07
Observation and Analysis of Results (S3)		08	05
Record (S2)		03	03
Mini-Project / Presentation/ Viva-Voce (S3)		06	05
Total Marks: 50		25	25

Assessment table

Assessment Tool	S1	S2	S2	S2	S3
	CO1	CO2	CO3	CO4	CO5
Term Work (25 Marks)	05	05	05	05	05
Practical Examination & Viva Voce (25 Marks)	05	05	05	05	05
Total Marks: 50					

Special Instructions

None

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CSPCC3008: Lab Compiler Design

Teaching Scheme		Examination Scheme	
Practical (Hours/Week)	**2**	ISE I (Term Work) (Marks)	**25**
Credits	**1**	ESE (Marks)	**25**

Course Outcomes

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

CO1: Understand the working of LEX & YACC tools for writing programs.
CO2: Incorporate the Lex & YACC tool for debugging programs.
CO3: Demonstrate the programs for identifiers, tokens & comments.
CO4: Develop programs in C or Lex for parsers.
CO5: Create a mini compiler using the lex & YACC tools with their program format.

List of the Experiments

#	Title of the Experiments	Skill Level	CO	ISE Marks
1	Study of LEX Analyzer Generator	S1	CO1	04
2	Study of YACC Generator	S1	CO1	04
3	Write a C program to identify whether a given line is a comment or not	S1	CO1, CO2	04
4	Implement a lex program to count the no. of vowels & consonants in a given string	S1	CO3	04
5	Implement a lex program to count the no. of characters, words, spaces & end lines in a given input file	S2	CO2, CO3	04
6	Implement a lex program to count the no. of -ve & +ve integers & fractions	S2	CO2, CO3	04
7	Implement a program to find out whether the string is a keyword or not	S2	CO2	04
8	Implement a program to find out whether the string is an identifier or not	S2	CO2	04
9	Implement a program to find out whether the string is constant or not	S2	CO2	04
10	Write a C program to recognize strings under 'a*', 'a*b+', and 'abb'.	S2	CO3	04
11	Evaluate a C program for the generation of a Parse tree 64	S2	CO4	04
12	Implement the lexical analyser using JLex, flex, or other lexical analyser generating tools.	S2	CO5	06

Teacher's Assessment:

ISEI: In-Semester Evaluation of 25 marks based on the performance of students in practical hours, practical assignments completed, and timely submission.

ESE: End Semester Evaluation: In ESE of 25 marks, Practical conduct and Oral Examination.

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	3								1	1		3	3	1
CO2	2	3								1	1		3	3	1
CO3	2	3								1	1	1	3	3	1
CO4	2	3								1	1	1	3	3	1
CO5	2	3								1	1	1	3	3	1
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Skill Level	ISE I	ESE
S1	Imitation	5	5
S2	Manipulation	8	10
S3	Precision	12	10
S4	Articulation	0	0
55	Naturalization	0	0
Total Marks: 50		25	25

Assessment table

Assessment Tool	S1	S2	S2	S2	S3
	CO1	CO2	CO3	CO4	CO5
Term Work (25 Marks)	07	07	05	03	03
Practical Examination & Viva Voce (25 Marks)	05	05	05	05	05
Total Marks: 50					

Special Instructions

None

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CSPEC3013: Lab Machine Learning

Teaching Scheme		Examination Scheme	
Practical (Hours/Week)	**2**	ISE I (Term Work) (Marks)	**25**
Credits	**1**	ESE (Marks)	**25**

Course Outcomes

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

CO1: Generate a bag-of-words model
CO2: Apply classification algorithms like EM, HMM to suitable data.
CO3: Demonstrate logistic regression, association rule mining.
CO4: Apply dimensionality reduction using SVM
CO5: Develop any application using RL

List of the Experiments

The student shall perform a minimum of ten experiments of the following using Python.

#	Title of the Experiments	Skill Level	CO	ISE Marks
	Level: Basic (all)			
1	Generate a bag-of-words model, an n-gram model	S1	CO1	02
2	Apply the decision tree algorithm to suitable data	S2	CO2	02
3	Apply HMM to suitable data	S2	CO2	02
4	Classify using SVM	S2	CO2	03
5	Classify using ensemble methods	S2	CO2	03
	Level: Moderate (all)			
6	Apply the EM algorithm to suitable data	S3	CO3	02
7	Apply association rule mining	S3	CO4	02
8	Apply Logistic regression	S2	CO4	02
9	Apply hierarchical clustering to suitable data	S3	CO3	02
	Level: Complex (any one)			
10	Apply RL to suitable data	S3	CO3	02
11	Generate a solution using RL for personal recommendation	S3	CO5	03

Teacher's Assessment:

ISEI: In-Semester Evaluation of 25 marks based on the performance of students in practical hours, practical assignments completed, and timely submission.

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	1	3				2	1	2		3	2	1	2
CO2	3	3	1	3				2	1	2		3	2	1	2
CO3	3	3	1	3				2	1	2		3	2	1	2
CO4	3	3	1	3				2	1	2		3	2	1	2
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Skill Level	ISE I	ESE
S1	Imitation	5	5
S2	Manipulation	15	15
S3	Precision	5	5
S4	Articulation	0	0
55	Naturalization	0	0
Total Marks: 50		25	25

Assessment table

Assessment Tool	S1	S2, S3
	CO1	CO2, CO3, CO4, CO5
Term Work (25 Marks)	5	20
Practical Examination & Viva Voce (25 Marks)	2	23
Total Marks: 50		

Special Instructions

None

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CSPEC3014: Lab Computer Vision

Teaching Scheme		Examination Scheme	
Practical (Hours/Week)	**2**	ISE I (Term Work) (Marks)	**25**
Credits	**1**	ESE (Marks)	**25**

Course Outcomes

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

CO1: Illustrate the contour detection to detect boundaries
CO2: Implement the segmentation of the image
CO3: Recognize the object detection system
CO4: Develop a motion detection system

List of the Experiments

The student shall perform a minimum of ten experiments of the following using Python.

#	Title of the Experiments	Skill Level	CO	ISE Marks
	Level: Basic (all)			
1	To implement Contours for boundaries of the shape to detect certain types of shapes.	S1	CO1	02
2	To implement the graph cut segmentation	S2	CO2	02
3	To implement the mean shift segmentation	S2	CO2	02
4	To obtain a histogram equalization image	S2	CO2	03
5	To implement a colour detection and edge detection algorithm	S2	CO2	03
	Level: Moderate (all)			
6	To implement Object tracking with particle filters	S3	CO3	02
7	To implement the hand gesture recognition	S3	CO4	02
8	To implement the 3D object	S2	CO3	02
9	To implement a smoothing or averaging filter in the spatial domain.	S3	CO4	02
	Level: Complex (any one)			
10	Implement object counting.	S3	CO3	02
11	Implement human counting.	S3	CO3	03

Teacher's Assessment:

ISEI: In-Semester Evaluation of 25 marks based on the performance of students in practical hours, practical assignments completed, and timely submission.

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	1		1				1	3		2	1	2	
CO2	3	3	2		1			1	1	3		2	1	2	
CO3	3	2	1		1			1	1	3		3	1	2	
CO4	3	2	1		1			1	1	3		3	1	2	1
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Skill Level	ISE I	ESE
S1	Imitation	5	5
S2	Manipulation	15	15
S3	Precision	5	5
S4	Articulation	0	0
55	Naturalization	0	0
Total Marks: 50		25	25

Assessment table

Assessment Tool	S1	S2, S3
	CO1	CO2, CO3, CO4
Term Work (25 Marks)	5	20
Practical Examination & Viva Voce (25 Marks)	2	23
Total Marks: 50		

Special Instructions

None

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CSPEC3015 Lab: Software Testing & Quality Assurance

Teaching Scheme		Examination Scheme	
practical (Hours/Week)	**2**	ISE I (Term Work) (Marks)	**25**
Credits	**1**	ESE (Marks)	**25**

Prerequisite
Software Engineering

List of Programs
The term work shall consist of the following programs

#	Title of the Programs
1	Examine the SDLC with software development models
2	Design and construct the test cases through Manual testing
3	Examine the Automation Testing Tool
4	Examine the WinRunner Testing tool
5	Recording test cases in context-sensitive mode
6	Recording test cases in Analog mode
7	Design and construct the test cases through Synchronizing testing
8	Design and construct the test cases for checking the GUI Objects
9	Design and construct the test cases for checking Bitmap Objects
10	Design and construct the test cases for the testing program using TSL
11	Load Testing of software

Teacher's Assessment:
Practical Examination will consist of Performance and Viva-voice Examination
The assessment will be based on the following –

- ➔ Performance in the practical examination
- ➔ Record of programs submitted by the candidate
- ➔ Setting goals higher than expected from the problem statement
- ➔ Innovation & Creativity
- ➔ Team building skills
- ➔ Technical writing skills

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1				3											
CO2	3														
CO3				2						3				2	
CO4	3														
CO5													3		
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Knowledge Level	ISE I	ESE
K1	Remember	05	05
K2	Understand	00	00
K3	Apply	05	05
K4	Analyse	05	05
K5	Evaluate	05	00
K6	Create	05	10
Total Marks: 50		25	25

Special Instructions

None

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Approved Updated Curriculum in XXIXth Academic Council
Dated: 25th March 2025

CSPEC3016: Lab Natural Language Processing (PE-III)

Teaching Scheme		Examination Scheme	
practical (Hours/Week)	**2**	ISE I (Term Work) (Marks)	**25**
Credits	**1**	ESE (Marks)	**25**

Course Outcomes

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

CO1: Understand and apply text preprocessing techniques such as tokenization, stop word removal, stemming, lemmatization, and text normalization.

CO2: Implement text representation techniques like Bag of Words (BoW), TF-IDF, and N-gram models for text generation.

CO3: Develop and evaluate models for NLP tasks such as text classification, sentiment analysis, spam detection, and word embeddings.

CO4: Implement advanced NLP applications, including text summarization, using deep learning and transformer-based models.

CO5: Utilize probabilistic and deep learning models for topic modelling and question answering systems using techniques like LDA and BERT.

List of the Experiments

The student shall perform a minimum of 8 experiments of the following using NLP tools & algorithms.

#	Title of the Experiments	Skill Level	CO	ISE Marks
1	Write a Python script to read data and implement stop word removal using NLTK. Convert text to lowercase, remove punctuation, and handle contractions. Use regex to extract email IDs, phone numbers, or URLs from text.	SO1	CO1	3
2	Write a Python script to tokenize a given text using NLTK and spaCy. Perform stemming and lemmatization.	SO2	CO1	3
3	Write a Python script to implement BoW and TF-IDF on a dataset using Scikit-learn.	SO2	CO2	2
4	Write a Python script to implement an N-gram model for text generation: Extract unigrams, bigrams, and trigrams from a given text, and generate new text using an N-gram language model.	SO2	CO2	2
5	Write a Python script to train a model (Naïve Bayes, SVM) to classify emails as spam or not spam.	SO3	CO3	2
6	Write a Python script to train Word2Vec embeddings using Gensim, and Load pre-trained GloVe embeddings for text similarity analysis.	SO3	CO3	3
7	Write a Python script to train a Naïve Bayes and Logistic Regression classifier for sentiment analysis. 72	SO3	CO3	3

8	Write a Python script to implement LDA to discover hidden topics in a set of documents.	SO4	CO5	3
9	Write a Python script to build a question-answering system using a fine-tuned BERT model.	SO4	CO5	3
10	Write a Python script to implement text summarization using NLP techniques and transformers.	SO4	CO4	2

Teacher's Assessment:

ISEI: In-Semester Evaluation of 25 marks based on the performance of students in practical hours, practical assignments completed, and timely submission.

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	1	3				2	1	2		3	2	1	2
CO2	3	3	1	3				2	1	2		3	2	1	2
CO3	3	3	1	3				2	1	2		3	2	1	2
CO4	3	3	1	3				2	1	2		3	2	1	2
CO5	3	3	1	3				2	1	2		3	2	1	2
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Skill Level	ISE I	ESE
S1	Imitation	5	5
S2	Manipulation	15	15
S3	Precision	5	5
S4	Articulation	0	0
55	Naturalization	0	0
Total Marks: 50		25	25

Assessment table

Assessment Tool	S1	S2, S3
	CO1	CO2, CO3, CO4, CO5
Term Work (25 Marks)	5	20
Practical Examination & Viva Voce (25 Marks)	2	23
Total Marks: 50		

Special Instructions

None

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Head, CSE

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CSPEC3017: Lab Neural Network (PE-III)

Teaching Scheme		Examination Scheme	
practical (Hours/Week)	**2**	ISE I (Term Work) (Marks)	**25**
Credits	**1**	ESE (Marks)	**25**

Course Outcomes

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

CO1: Generating "bag of words" models
CO2: Apply Classification algorithms like EM, HMM to suitable data
CO3: Demonstrate logistic regression, association rule mining
CO4: Apply dimensionality reduction using SVM
CO5: Develop any application using R

List of the Experiments

#	Title of the Experiments	Skill Level	CO	ISE Marks
1	Parallel and Distributed Processing - I: Interactive activation and competition models.	SO1	CO1	4
2	Parallel and Distributed Processing - II: Constraint satisfaction neural network models.	SO1	CO1	4
3	Perceptron Learning: Implementing perceptron for classification.	SO2	CO2	4
4	Multilayer Feedforward Neural Networks: Implementing MLP with Backpropagation	SO2	CO2	4
5	Hopfield Model for Pattern Storage Task: Associative memory and pattern retrieval	SO3	CO3	5
6	Hopfield Model with Stochastic Update:	SO3	CO3	6
7	Competitive Learning Neural Networks: Implementing self-organizing maps for pattern clustering	SO3	CO3	5
8	Solution to the Travelling Salesman Problem: Using self-organizing maps (SOM)	SO3	CO5	6
9	Optimization using Hopfield Models: Implementing Hopfield networks for solving optimization problems	SO3	CO5	6
10	Weighted Matching Problem: Deterministic, stochastic, and mean-field annealing using Hopfield networks	SO3	CO4	6

Teacher's Assessment:

ISEI: In-Semester Evaluation of 25 marks based on the performance of students in practical hours, practical assignments completed, and timely submission.

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	1	3				2	1	2		3	2	1	2
CO2	3	3	1	3				2	1	2		3	2	1	2
CO3	3	3	1	3				2	1	2		3	2	1	2
CO4	3	3	1	3				2	1	2		3	2	1	2
CO5	3	3	1	3				2	1	2		3	2	1	2
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Skill Level	ISE I	ESE
S1	Imitation	5	5
S2	Manipulation	15	15
S3	Precision	5	5
S4	Articulation	0	0
55	Naturalization	0	0
Total Marks: 50		25	25

Assessment table

Assessment Tool	S1	S2, S3
	CO1	CO2, CO3, CO4, CO5
Term Work (25 Marks)	5	20
Practical Examination & Viva Voce (25 Marks)	2	23
Total Marks: 50		

Special Instructions

Deep Learning Applications

Students must implement solutions for any three of the following tasks

1. Colorization of black-and-white images
2. Adding sounds to silent movies
3. Automatic machine translation
4. Object classification in photographs
5. Automatic handwriting generation
6. Character text generation
7. Image caption generation
8. Automatic game playing

CSPEC3018: Lab Cryptography and Network Security (PE-III)

Teaching Scheme		Examination Scheme	
practical (Hours/Week)	**2**	ISE I (Term Work) (Marks)	**25**
Credits	**1**	ESE (Marks)	**25**

Course Outcomes

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

CO1: Identify Vulnerabilities in a Network
CO2: Solve Problems using various Algorithms
CO3: Identify Various Attacks and Formulate a Defence Mechanism
CO4: Understand Wireless Security
CO5: Understand Web Security for email transfers

List of the Experiments

#	Title of the Experiments	Skill Level	CO	ISE Marks
	Level: Basic (all)			
1	Network/Vulnerability scanner (case study: Nmap and Nessus)	S1	CO1	04
2	Write a program to implement the Caesar Cipher and play Playfair Cipher Algorithms	S2	CO2	04
3	Implement the RSA algorithm for encryption.	S2	CO2	04
4	Implement the Diffie-Hellman Key Exchange mechanism.	S1	CO3	04
5	Implement the Hill cipher Encryption technique.	S2	CO2	04
	Level: Moderate (all)			
6	Firewalls - Case Study	S2	CO3, CO4	05
7	Calculate the message digest of a text using the SHA-1 algorithm.	S2	CO4	05
	Level: Complex (all)			
9	Packet Sniffers: “Tcpdump”, Ettercap, “Dsniff”	S2	CO4	05
10	Intrusion Detection/Prevention Systems (case study: Snort IDS)	S2	CO4	05
11	Using PGP Mail freeware to encrypt and sign email messages and individual files	S2	CO5	04

Teacher’s Assessment:

ISEI: In-Semester Evaluation of 25 marks based on the performance of students in practical hours, practical assignments completed, and timely submission.

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1									3					
CO2	2									2				1	
CO3	2									2				1	
CO4	2								2	2		1		1	1
CO5	2	1	1	1	1			2	3	2	3	1	3	1	1
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Skill Level	ISE I	ESE
S1	Imitation	5	5
S2	Manipulation	15	15
S3	Precision	5	5
S4	Articulation	0	0
55	Naturalization	0	0
Total Marks: 50		25	25

Assessment table

Assessment Tool	S1	S2, S3
	CO1	CO2, CO3, CO4, CO5
Term Work (25 Marks)	5	20
Practical Examination & Viva Voce (25 Marks)	10	15
Total Marks: 50		

Special Instructions

None

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MDM5004: Artificial Intelligence

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

Programming and Problem solving, Data Structures and Algorithms

Course description

AI study encompasses problem-solving with unique search strategies, multi-agent environment analysis, and knowledge/reasoning fundamentals for goal-oriented action plans. The ultimate aim is unconventional, optimal real-world problem-solving.

Course Outcomes

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

- **CO1:** Identify and apply suitable Intelligent agents for various AI applications
- **CO2:** Build a smart system using different informed search/uninformed search, or heuristic approaches
- **CO3:** Identify the knowledge associated and represent it by ontological engineering to plan a strategy to solve the given problem
- **CO4:** Apply the suitable algorithms to solve AI problems.
- **CO5:** Implement ideas underlying modern logical inference systems.
- **CO6:** Represent complex problems with expressive yet carefully constrained language of representation

Detailed Syllabus

UNIT I	**Introduction:** Introduction to Artificial Intelligence, Foundations of Artificial Intelligence, History of Artificial Intelligence, State of the Art, Risks and Benefits of AI, Intelligent Agents, Agents and Environments, Good Behaviour: Concept of Rationality, Nature of Environments, Structure of Agents.
UNIT II	**Problem-solving & Game Theory:** Solving Problems by Searching, Problem-Solving Agents, Example Problems, Search Algorithms, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions, Search in Complex Environments, Local Search and Optimization Problems, Optimal Decisions in Games, Heuristic Alpha–Beta Tree Search, Monte Carlo Tree Search, Stochastic Games, Partially Observable Games, Limitations of Game Search Algorithms, Constraint Satisfaction Problems (CSP), Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs.
UNIT III	**Knowledge:** Logical Agents, Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic: A Very Simple Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic, First-Order Logic, Representation Revisited, Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic.

UNIT IV	**Reasoning:** Inference in First-Order Logic, Propositional vs. First-Order Inference, Unification and First-Order Inference, Forward Chaining, Backward Chaining, Resolution, Knowledge Representation, Ontological Engineering, Categories and Objects, Events, Mental Objects and Modal Logic, Reasoning Systems for Categories, Reasoning with Default Information
UNIT V	**Planning:** Automated Planning, Classical Planning, Algorithms for Classical Planning, Heuristics for Planning, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Time, Schedules, and Resources, Analysis of Planning Approaches, Limits of AI, Ethics of AI, Future of AI, AI Components, AI Architectures.

Text Books

- Stuart Russell und Peter Norvig, Künstliche Intelligenz: Ein moderner Ansatz, dritte Auflage, Pearson, 2003
- Deepak Khemani, Ein erster Kurs in Künstliche Intelligenz, McGraw Hill Education (Indien), 2013, ISBN: 978-1-25-902998-1
- Elaine Rich, Kevin Knight und Nair, „Künstliche Intelligenz “, TMH, ISBN: 978-0-07-008770

Reference Books

- Nilsson Nils J, „Artificial Intelligence: A New Synthesis “, Morgan Kaufmann Publishers Inc., San Francisco, CA, ISBN: 978-1-55-860467-4
- Patrick Henry Winston, „Artificial Intelligence “, Addison-Wesley Publishing Company, ISBN: 0-201-53377-4
- Andries P. Engelbrecht, „Computational Intelligence: An Introduction “, 2. Auflage, Wiley India, ISBN: 978-0-470-51250-0
- Dr. Lavika Goel, „Artificial Intelligence: Concepts and Applications “, Wiley Publication, ISBN: 9788126519934
- Dr. Nilakshi Jain, „Artificial Intelligence, as per AICTE: Making a System Intelligent “, Wiley Publication, ISBN: 9788126579945

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	2	2	1	-	-	1	3	-	2	-	-			
CO2	1	3	3	2	3	1	-	3	1	2	-	-			
CO3	3	2	2	2	1	1	1	-	-	2	-	-		2	
CO4	1	2	2	1	-	-	1	3	1	2	-	-			
CO5	1	2	2	1	-	-	1	3	1	2	-	-	3		
CO6		2	2	1	-	-	1	3	1	2	-	-			
3 – High, 2 – Medium, 1 - Low															

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Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- ➔ Quiz
- ➔ Assignments
- ➔ Question and answer
- ➔ PowerPoint presentation

Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	05	00	00	10
K2	Understand	05	05	00	10
K3	Apply	05	05	00	10
K4	Analyse	00	05	05	10
K5	Evaluate	00	00	00	20
K6	Create	00	00	05	00
Total Marks: 100		15	15	10	60

Assessment table

Assessment Tool	K1, K2	K3
	CO1, CO2	CO3, CO4, CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	05	10
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	20	40
Total Marks: 100		

Special Instructions

None

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MDM5005: Lab Artificial Intelligence

Teaching Scheme		Examination Scheme	
practical (Hours/Week)	**2**	ISE I (Term Work) (Marks)	**25**
Credits	**1**	ESE (Marks)	**25**

Prerequisite
Artificial Intelligence

List of Programs
The term work shall consist of the following programs

#	Title of the Programs
1	Implement a simple intelligent agent (e.g., a vacuum cleaner robot)
2	Implement MCTS for games like tic-tac-toe or connect four
3	Implement the A* algorithm for any game search problem
4	Implement Minimax and optimize it using Alpha-Beta pruning to play a two-player game like tic-tac-toe or chess
5	Implement the Wumpus World in Python or Java, where an agent needs to navigate a cave with dangers
6	Implement forward chaining and backward chaining for rule-based inference
7	Implement a heuristic search for planning in uncertain or complex environments (e.g., traveling salesman problem)
8	Case Study: Research a modern AI system (e.g., GPT-4, AlphaGo) and implement a mini-project that mimics a small part of its functionality
9	Case study: Implement a simple decision-making system that adheres to ethical guidelines (e.g., fairness in job recruitment)
10	Use GPT to generate simple code based on natural language descriptions

Teacher's Assessment:
Practical Examination will consist of Performance and Viva-voice Examination
The assessment will be based on the following –

- ➔ Performance in the practical examination
- ➔ Record of programs submitted by the candidate
- ➔ Setting goals higher than expected from the problem statement
- ➔ Innovation & Creativity
- ➔ Team building skills
- ➔ Technical writing skills

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	-	2	-	3	-	-	2	2	2	1	2			
CO2	1	-	2	2	3	2	-	2	2	2	1	2			
CO3	1	-	2	2	3	2	-	2	2	2	2	2		2	
CO4	1	-	2	-	3	-	-	2	2	2	2	2			
CO5	1	-	2	-	3	-	-	2	2	2	2	2	3		
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Knowledge Level	ISE I	ESE
K1	Remember	05	05
K2	Understand	00	00
K3	Apply	05	05
K4	Analyse	05	05
K5	Evaluate	05	00
K6	Create	05	10
Total Marks: 50		25	25

Special Instructions

None

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MDM5006: Neural Network

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

None

Course description

This course provides a comprehensive understanding of Neural Networks, covering their fundamental concepts, architectures, and applications. Students will learn about perceptron, multi-layer networks, activation functions, and training algorithms such as backpropagation. The course will also explore techniques for improving neural network performance, including weight regularization, optimization methods, and generalization strategies. By engaging in practical implementations, students will develop skills to design, train, and evaluate neural networks for solving real-world problems.

Course Outcomes

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

- **CO1:** Differentiate between various neural network architectures and their computational properties.
- **CO2:** Identify real-world problems where neural networks can be effectively applied.
- **CO3:** Design and implement feedforward and recurrent neural networks using suitable algorithms and frameworks.
- **CO4:** Analyse and evaluate neural network models based on performance metrics and optimization techniques.
- **CO5:** Explore research opportunities in neural networks and prepare for advanced studies in AI and machine learning

Detailed Syllabus

UNIT I	Overview of Artificial Intelligence and Machine Learning, Basics of Neural Networks: Biological Neuron vs. Artificial Neuron, Structure of an Artificial Neuron, Neuron Activation Functions (Sigmoid, ReLU, Tanh). Types of Neural Networks: Single-Layer Perceptron (SLP) and Multi-Layer Perceptron (MLP).
UNIT II	Supervised vs. Unsupervised Learning, Training a Neural Network: Weight Initialization, Forward and Backward Propagation, Loss Functions and Gradient Descent, Overfitting and Regularization Techniques. Introduction to Optimization Algorithms (SGD, Momentum, Adam).
UNIT III	Feedforward Neural Networks (FNN), Recurrent Neural Networks, Introduction to Convolutional Neural Networks, Hands-on Practice (Using Online Tools like Google Teachable Machine)

UNIT IV	Neural Networks in Industrial Applications: Fault Detection in Machines, Quality Control in Manufacturing, Predictive Maintenance. Neural Networks in Healthcare: Disease Prediction, Image-based Diagnosis, Basic Case Study Discussion
UNIT V	Limitations of Neural Networks: Need for Large Datasets, High Computational Requirements, Interpretability Issues, Introduction to Explainable AI (XAI), Emerging Trends in Neural Networks, AI in Robotics, Neural Networks in Smart Cities.

Text Books

- Neural Network and Deep Learning – Michael Nielsen
- Neural Networks and Learning Machines – Simon Haykin.
- Fundamentals of Neural Networks: Architectures, Algorithms, and Applications – Laurene Fausett.
- Introduction to Artificial Neural Networks – S. N. Sivanandam, S. Sumathi, and S. N. Deepa.

Reference Books

- Deep Learning Neural Networks: Design and Case Study – Danial Graupe
- Visualizing and understanding a convolutional neural network- Manjunath
- Deep Learning – Ian Goodfellow, Yoshua Bengio, and Aaron Courville.
- Pattern Recognition and Machine Learning– Christopher Bishop.

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3											1	3		
CO2	1														
CO3	2	2	1										2		
CO4	3	1	2		1				2	1			1	1	
CO5	3	1			1			1	1			1	1	1	1
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- Quiz
- Assignments
- Question and answer
- PowerPoint presentation

Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	00	00	00	10
K2	Understand	10	10	05	20
K3	Apply	05	05	05	30
K4	Analyse	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks: 100		15	15	10	60

Assessment table

Assessment Tool	K1, K2	K3
	CO1	CO2, CO3, CO4, CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	10	05
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	30	30
Total Marks: 100		

Special Instructions

None

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MDM6004: Java Programming

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

Basic Programming Concept, C Programming, and Object-Oriented Programming, Basic Knowledge of the implementation of programming flow structure, and platform independence.
Network-Based Application Development Using Java Programming

Course Outcomes

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

CO1: Develop a Java program using classes and objects
CO2: Develop a Java program for implementing the code reusability concept
CO3: Develop a program to implement multithreading and exception handling
CO4: Develop a Java program for implementing event handling using a window-based application
CO5: Develop a Java program for managing a database

Detailed Syllabus

UNIT I	**Introduction to Java** Java features and the Java programming environment, Defining a class, creating object, accessing class members, Java tokens and data types, symbolic constant, scope of variable, typecasting, and different types of operators and expressions, decision making and looping statements, Arrays, strings, string buffer classes, vectors, wrapper classes. Constructors and methods, types of constructors, method and constructor overloading, nesting of methods, command line arguments, garbage collection, visibility control: public, private, protected, default, private protected
UNIT II	**Inheritance, Interface, and Packages** *Inheritance:* concept of inheritance, types of Inheritance: single inheritance, multilevel inheritance, hierarchical inheritance, method overriding, final variables, final methods, use of super, abstract methods, and classes *Interfaces:* Define interface, implementing interface, accessing interface variables and methods, extending interfaces *Package:* Define package, types of packages, naming and creating package, accessing package, import statement, static import, adding class and interfaces to a package
UNIT III	**Exception Handling and Multithreading** *Errors and Exception:* Types of errors and exceptions, try and catch statement, throws and finally statement, built-in exceptions, throwing our own exception. *Multithreaded programming:* Creating a thread: By extending to thread class and by implementing the Runnable interface, Life cycle of a thread: Thread methods, thread exceptions, thread priority, and methods

UNIT IV	**Event Handling using Abstract Window Toolkit & Swing Components** Component, container, window, frame, panel *Use of AWT controls:* labels, buttons, checkboxes, checkbox groups, text fields, and text areas *Use of layout managers:* flow Layout, border Layout, grid Layout, grid Bag Layout, menu bars, menus, file dialog *Introduction to Swing:* Swing features, difference between AWT and Swing. *Swing components:* Icons and Labels, Text Field, Combo Box, Button, Checkbox, Radio Button *Advanced Swing Components:* Tabbed Panes, Scroll Panes, Trees, Tables, Progress Bar, Tool Tips
UNIT V	**Basic of Network Programming** *Socket Overview:* Client/Server, proxy servers, internet addressing, Java and networking classes and interfaces, TCP/IP client and server sockets, datagram sockets & packets, URL class, URL Connection class *Introduction to JDBC, ODBC, JDBC architecture:* Two-tier and Three-tier models, Types of JDBC drivers, Driver Managers class, Connection Interface

Text Books

- Programming with Java (E Bala Guruswamy, McGraw-Hill Education (India) Private Limited, New Delhi ISBN -13: 978-93-5134-320-2)
- Java Complete Reference (Schildt, Herbert, McGraw-Hill Education, New Delhi, 9789339212094)
- Java 8 Programming Black Book (Holzner, Steven etal Dreamtech Press, New Delhi, ISBN:978-93-5119-758-*4)

Related Resources

- https://www.w3schools.com/java/
- https://www.tutorialspoint.com/java/index.htm
- https://onecompiler.com/java

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1									1		1
CO2	3	2	2	3						2		1	1		1
CO3	2	2	1	3						3		1	1	2	1
CO4	2	2	2	3						3		1	2	2	1
CO5	2	2	1	3						3		1	2	2	1
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- ➔ Quiz
- ➔ Assignments
- ➔ Question and answer
- ➔ PowerPoint presentation

Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	15	05	15	15
K2	Understand	15	00	20	15
K3	Apply	00	05	25	00
K4	Analyse	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	15	05	15	15
Total Marks: 100		15	15	10	60

Assessment table

Assessment Tool	K1	K2	K3	K1	K3
	C01	C02	C03	CO4	CO5
ISE I & II (30 Marks)	15	10	05	00	00
ISE III (10 Marks)	05	00	00	05	00
ESE Assessment (60 Marks)	15	15	10	10	10

Special Instructions

None

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MDM6005: Lab Java Programming

Teaching Scheme		Examination Scheme	
practical (Hours/Week)	**2**	ISE I (Term Work) (Marks)	**25**
Credits	**1**	ESE (Marks)	**25**

Prerequisite

Basic Programming Concept, C Programming, and Object-Oriented Programming, Basic Knowledge of the implementation of programming flow structure, and platform independence. Network-Based Application Development Using Java Programming

Course Outcomes

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

CO1: Develop a Java program using classes and objects
CO2: Develop a Java program for implementing the code reusability concept
CO3: Develop a program to implement multithreading and exception handling
CO4: Develop a Java program for implementing event handling using a window-based application
CO5: Develop a Java program for managing a database

List of the Experiments

#	Title of the Experiments	Skill Level	CO	ISE Marks
	Level: Basic (all)			
1	Develop a program to implement different control structures	S1	CO1	02
2	Implement arrays and vectors in Java	S1	CO1	02
3	Initialize objects using constructors	S1	CO1	02
4	Implement concepts of inheritance for code reusability	S2	CO2	03
5	Implement packages in Java	S2	CO2	03
	Level: Moderate (all)			
6	Identify the different types of errors using exception handling	S3	CO3	02
7	Manage different types of user-defined exceptions	S3	CO3	02
8	Design a GUI using different AWT components	S2	CO4	02
9	Implement Swing components in a frame	S3	CO4	02
	Level: Complex (all)			
10	Extract the hostname and IP address using the InetAddress Class	S3	CO5	02
11	Manage the database using JDBC	S3	CO5	03

Teacher's Assessment:

ISEI: In-Semester Evaluation of 25 marks based on the performance of students in practical hours, practical assignments completed, and timely submission.

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	1	3				2	1	2		3	2	1	2
CO2	3	3	1	3				2	1	2		3	2	1	2
CO3	3	3	1	3				2	1	2		3	2	1	2
CO4	3	3	1	3				2	1	2		3	2	1	2
CO5	3	3	1	3	2			2	1	2		3	2	1	2
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Skill Level	ISE I	ESE
S1	Imitation	5	2
S2	Manipulation	5	12
S3	Precision	5	11
S4	Articulation	5	0
55	Naturalization	5	0
Total Marks: 50		25	25

Assessment table

Assessment Tool	S1	S2, S3
	CO1	CO2, CO3, CO4, CO5
Term Work (25 Marks)	5	20
Practical Examination & Viva Voce (25 Marks)	6	19
Total Marks: 50		

Special Instructions

None

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MDM6006: Python programming

Teaching Scheme		Examination Scheme	
Lectures (Hours/Week)	**3**	ISE I (Marks)	**15**
Tutorials (Hours/Week)	**0**	ISE II (Marks)	**15**
Credits	**3**	ISE III (Marks)	**10**
		ESE (Marks)	**60**

Prerequisite

Basic Programming Knowledge

Course Outcomes

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

CO6: Use program design tools and an IDE for Python.
CO7: Employ Python building blocks and data types in programming.
CO8: Implement conditional and looping statements in Python programming.
CO9: Implement built-in functions and modules in Python programming.
CO10: Use NumPy for performing operations on lists and arrays.

Detailed Syllabus

UNIT I	**Introduction to Python Programming** 1. Revision of Computer Components (CPU, I/O devices) 2. Applications of computers and programming languages in the Mechanical engineering domain. 3. Program Designing Tools: Algorithm, Flow Chart. 4. Introduction and Features of Python: Open source, Interactive, Interpreted, Object-oriented, Platform independent, etc., Installation & working of IDEs.
UNIT II	**Python building blocks & data types** 1. Python building blocks: Identifiers, Indentation, Comments, Variables, Arithmetic and assignment operators, and Expressions. 2. Data Types: Integers, float, complex, string, and their declaration, data type conversion. 3. Accepting input from the user: I/O functions. 4. Container Types: List, tuple, set, and their declaration. 5. Write a simple Python program to display a “Welcome” message.
UNIT III	**Python operators and Control flow** 1. Relational and Logical operators. 2. Decision-making statements: if, if-else, if-elif-else statements. 3. Looping statements: while loop, for loop, Nested loops. 4. Loop manipulation using continue, pass, and break statements.
UNIT IV	**Python functions and modules** 1. Functions: Use of built-in functions, data conversion functions, abs, pow, min, max, round, ceil, floor, etc. 2. Modules: Use of built-in modules- ‘math’, ‘cmath’, ‘random’, and statistics. 3. User-defined function: Function definition, function calling, function arguments and parameter passing, Return statement, scope of variables.

UNIT V	**Lists and arrays in Python** 1. 5.1 List: define list (one and multi-dimensional), accessing, deleting, and updating values in a list. 2. 5.2 Basic list operations: slicing, repeating, concatenation, and iteration. 3. 5.3 NumPy array: Generate NumPy arrays and construct multidimensional arrays.

Text Books

- Fundamentals of Python: First Programs, 2E - Kenneth A. Lambert
- Let Us Python - 6th Edition - Yashavant Kanetkar, Aditya Kanetkar

Related Resources

- Official Documentation https://docs.python.org
- https://www.w3schools.com/python
- https://www.tutorialspoint.com/python/index.htm

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	2	3				2				2	1		
CO2	2	2	2	3				2				2	1		
CO3	2	2	2	3				2				2	1	2	
CO4	2	2	2	3				2				3		2	3
CO5	2	2	2	3				2				3	2	2	3
3 – High, 2 – Medium, 1 - Low															

Teacher's Assessment:

ISE I and ISE II: In semester evaluations (ISE I and ISE II) of 15 marks, each will be based on Class Test I and Class Test II, respectively.

ISE III: Teachers' Assessment of 10 marks is based on one / or a combination of the following:

- Quiz
- Assignments
- Question and answer
- PowerPoint presentation

Assessment Pattern

Level No.	Knowledge Level	ISE I	ISE II	ISE III	ESE
K1	Remember	00	00	00	10
K2	Understand	10	10	05	20
K3	Apply	05	05	05	30
K4	Analyse	00	00	00	00
K5	Evaluate	00	00	00	00
K6	Create	00	00	00	00
Total Marks: 100		15	15	10	60

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Assessment table

Assessment Tool	K1, K2	K3
	CO1	CO2, CO3, CO4, CO5
ISE I (15 Marks)	10	05
ISE II (15 Marks)	10	05
ISE III (10 Marks)	05	05
ESE Assessment (60 Marks)	30	30
Total Marks: 100		

Special Instructions

None

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CSVEC3001: (A) Lab Java Programming

Teaching Scheme		Examination Scheme	
practical (Hours/Week)	**4**	ISE I (Term Work) (Marks)	**50**
Credits	**2**	ESE (Marks)	**50**

Prerequisite

Basic Programming Concepts, Object Oriented Programming Basics, Data Structures, and Exception Handling. Java Collections Framework, Databases, and SQL Basic (JDBC, Spring Data, etc.)

Course description

This Course covers advanced Java concepts used to build Web Apps, Game Development using JDBC, AJAX, Swing, MVC, and Hibernate.

Course Outcomes

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

- **CO1:** Develop programs using GUI Framework (AWT & Swing)
- **CO2:** Understand the features of the advanced concepts of Java
- **CO3:** Incorporate the JDBC Driver to perform CRUD operations
- **CO4:** Creating basic JSP, Servlet pages and adding AJAX to them
- **CO5:** Create the application using Spring and Spring Boot

List of the Experiments

#	Title of the Experiments	Skill Level	CO	ISE Marks
	Level: Basic (all)			
1	Design a Menu bar and Menu Items using AWT	S1	CO1	04
2	Implement a GUI using Swing on a Web Page	S2	CO1	04
3	Implement the Collection Framework using Stack, Array, and Vector	S1	CO2	04
4	Implement Collection Framework using Queue, De-Queue, and TreeMap	S2	CO2	04
5	Implement Session tracking using Cookies	S1	CO2	04
	Level: Moderate (all)			
6	Configure JDBC Driver and Execute for Insert, Update, and Delete	S2	CO3	04
7	Configure JDBC Driver and Execute Program to Select data from the Database	S1	CO3	04
8	Configure Apache Tomcat and Create JSP Pages and Servlets	S1	CO4	04
9	Configure Servlets to use HTTP Methods like GET and POST	S2	CO4	04
10	Implement AJAX in a JSP Page	S2	CO4	04

Level: Complex (any two)				
11	Create a Spring Boot Application	S2	CO5	05
12	Create an application using Hibernate and ORM	S2	CO5	05
13	Create a Game Development 2D Game library like JavaFX or LibGDX	S2	CO2	05

Teacher's Assessment:
ISEI: In-Semester evaluation of marks based on the performance of students in practical hours, practical assignments completed, and timely submission.

Text Books

- Hebert Schildt, Java: The Complete Reference, 7th ed, New Delhi, Tata McGraw–Hill, 2017.

Related Resources

- NPTEL Course: Programming in Java
- Spring Board (Infosys Java Advanced Course)

Assessment Pattern

Level No.	Skill Level	ISE I	ESE
S1	Imitation	10	0
S2	Manipulation	20	0
S3	Precision	0	0
S4	Articulation	0	0
55	Naturalization	20	0
Total Marks: 50		50	0

Assessment table

Assessment Tool	S1	S2
	CO1, CO2	CO3, CO4, CO5
Term Work (25 Marks)	25	25
Practical Examination & Viva Voce (25 Marks)	00	00
Total Marks: 50		

Special Instructions
None

CSVEC3001: (B) Lab React Programming

Teaching Scheme		Examination Scheme	
practical (Hours/Week)	**4**	ISE I (Term Work) (Marks)	**50**
Credits	**2**	ESE (Marks)	**50**

Prerequisite

Basic knowledge of computers & Installing Programs. Basic Knowledge of HTML, CSS, and JavaScript. Knowledge of C or C++ Programming would be an added advantage.

Course description

React can change how you think about the designs you look at and the apps you build. When you build a user interface with React, you will first break it apart into pieces called components. Then, you will describe the different visual states for each of your components. Finally, you will connect your components so that the data flows through them.

Course objectives

- ➔ To make students familiar with the advantages of the React Framework
- ➔ To enable students to create their first React Component
- ➔ To write programs using Variables, Operators, Data Types & Conditional Statements
- ➔ To explore how to respond to events, object state, etc., using React

Course Outcomes

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

CO1: Understand the installation procedure, environment setup for React
CO2: Work with Classes, Data Types, Variables, and other coding blocks in ES6 & React
CO3: Apply JSX in React, React Components
CO4: Use React Props, Events in programming
CO5: Create Forms using React, React Router, React Hooks

Detailed Syllabus (for reference)

UNIT I	Introduction: History, Features, setting up and Installation, Working with React, Introduction to Nodejs, NPM, Understanding ES6 Classes, Variables, Array Methods, etc, running the first app
UNIT II	Introduction to JSX, Rendering Elements, Components & Props,
UNIT III	State and Lifecycle, Handling Events, Conditional Rendering
UNIT IV	Lists & Keys, Forms, Composition vs Inheritance, Context in React
UNIT V	Introducing Hooks, Using the State Hook, Effect Hook, Rules of Hooks, Building your Hooks

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List of the Experiments

#	Title of the Experiments	Skill Level	CO	ISE Marks
	Level: Basic (all)			
1	Creating an Environment Setup for React	S1	CO1	04
2	Creating your first React Program	S2	CO1, CO2	04
3	Write a program to create a simple calculator Application using React JS	S2	CO2	04
4	Create a Simple Login and registration page using React JS	S2	CO2	04
5	Creating Function and Class Components	S2	CO3	04
6	Implement component inheritance by rendering a message in the Child Component passed from the Parent component.	S2	CO3	04
7	State and Lifecycle management using React	S2	CO3	04
8	Demonstrate Lists and Keys in React	S2	CO3	04
	Level: Moderate (all)			
9	Create a Webpage to handle events in React	S2	CO4	06
10	Create a program using Composition in React	S2	CO4	06
11	Creating Simple Forms using React	S2	CO5	06
12	Implement the concept of conditional rendering in React	S2	CO5	06
13	Demonstrate the use of state hooks	S2	CO5	06
14	Implement a program to build your Hooks in React	S2	CO5	06
	Level: Complex (all)			
15	Deploying Webpages on IIS and Demonstrating FileZilla	S2	CO4	06
16	Mini Project: Create a project on a Grocery delivery application	S2	CO3, CO5	06
17	Mini Project: Create a to-do list app using React	S2	CO3, CO5	06

Teacher's Assessment:
ISEI: In-Semester Evaluation of 50 marks based on the performance of students in practical hours, practical assignments completed, and timely submission.

Text Books

- Alex Banks, Eve Porcello, "Learning React" O'Reilly Media, Inc.
- Anthony Accomazzo, Nate Murray, Ari Lerner– "Full stack React" Fullstack.io.
- Robin Wieruch "The Road to React" Robin Wieruch

Related Resources

- https://beta.reactjs.org/learn
- https://www.w3schools.com/react/default.asp

Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3		1		2				1						
CO2	3	2	2		2				1			1	1		
CO3	3	1	1		2				1			1		1	
CO4	3	1	1		2				1			1	1	1	
CO5															
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Skill Level	ISE I	ESE
S1	Imitation	20	00
S2	Manipulation	30	00
S3	Precision	00	20
S4	Articulation	00	30
55	Naturalization	00	00
Total Marks: 100		50	50

Assessment table

Assessment Tool	S1	S2
	CO1	CO2, CO3, CO4, CO5
Term Work (25 Marks)	20	30
Practical Examination & Viva Voce (25 Marks)	20	30
Total Marks: 100		

Special Instructions

None

CSVEC3001: (C) Lab Web Technology

Teaching Scheme		Examination Scheme	
practical (Hours/Week)	**2**	ISE I (Term Work) (Marks)	**50**
Credits	**2**	ESE (Marks)	**50**

Prerequisite

None

Course description

This course aims at developing skills and awareness amongst students in the area of Web Technology using HTML and CSS. This is used to create websites and web applications that allow users to access information and interact with services online. After completion of this course, students will be able to understand concepts of Front-End Development and Create User Interfaces.

Course Outcomes

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

- **CO1:** Understand UI and UX Concepts, and create Wireframes and Prototypes
- **CO2:** Implement concepts of HTML 5 & CSS 3 in a Webpage
- **CO3:** Create webpages using Bootstrap and Materialize Frameworks.
- **CO4:** Create JavaScript programs to understand its
- **CO5:** Host website using Domain Name + Hosting Services.

Detailed Syllabus (for reference)

UNIT I	What is UI & UX, Various Job Roles, and why is it important? Start the UX Design Process: Empathize, Define, and Ideate, Build Wireframes and Low-Fidelity Prototypes, Conduct UX Research and Test Early Concepts.
UNIT II	Introduction to HTML 5: History, Important Elements and Attributes. Creating Forms using HTML 5, Creating a web page layout. Introduction to CSS 3 – Adding CSS Rules, CSS Properties, CSS Selectors, Design Issues, Minimizing CSS, Inheritance in CSS, Reset in CSS, Browser Compatibility using CSS
UNIT III	Bootstrap Framework: Getting Started, Introduction to Grid Basics, using components like navbar, carousel, etc. Using Font Awesome, Google Fonts for icons and typesetting Materialize Framework: Getting Started, Components, Forms, Other Components
UNIT IV	Learning JavaScript – Adding Scripts to web pages, Document Object Model, Starting Program with JavaScript, Functions, Operators, Conditional Statements, and Looping structure in JavaScript. Events in JavaScript.
UNIT V	Deployment – Deploying website on IIS, Introduction to domain and Hosting, uploading website, Introduction to SEO, Using Google Analytics, AdWords, and AdSense.

List of the Experiments

The student shall perform a minimum of ten experiments of the following using Oracle databases.

#	Title of the Experiments	Skill Level	CO	ISE Marks
Level: Basic (all)				
1	Creating User Research and User Profiles	S1	CO1	03
2	Creating Wireframes and Prototypes	S2	CO1, CO2	03
3	Creating Webpages from Wireframes	S2	CO2	03
4	Develop the HTML page named “Table.html” to display your class timetable.	S1	CO2	03
5	Design static web pages for an online bookstore website	S1	CO2	03
6	Creating a Personal Resume using HTML5 and CSS3	S1	CO3	03
7	Develop and demonstrate the usage of inline, internal, and external style sheets using CSS	S3	CO3	03
8	Adding Bootstrap Navigation and Carousel to the Webpage	S2	CO3	03
Level: Moderate (all)				
9	Create a Webpage using Materialize CSS	S2	CO2	05
10	Demonstrate JavaScript Functions and Events	S2	CO3	05
11	Creating a Simple Calculator using JavaScript	S2	CO4	05
12	Write a JavaScript program to dynamically bold, italicize, and underline words and phrases based on user actions.	S3	C04	05
13	Create a form similar to the one in the previous experiment. Put validation checks on values entered by the user using JavaScript (such as age should be a value between 1 and 150).	S4	C04	05
14	Deploying Webpages on IIS and Demonstrating FileZilla	S2	CO5	05
15	Using Font Awesome, Google Fonts, and Other UI Libraries in a Web Page	S2	CO5	05
Level: Complex (all)				
16	Create a Mini Project	S3	CO2, CO4	06

Teacher’s Assessment:

ISEI: In-Semester Evaluation of 50 marks based on the performance of students in practical hours, practical assignments completed, and timely submission.

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Mapping of Course Outcomes with Program Outcomes

#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1		3	2		1		2	2	1	3			3		
CO2		2	2		1		1	1	2	2			1		
CO3		1	1						1				2		1
CO4		1	2						3				1		1
CO5		1	2						2				1		1
3 – High, 2 – Medium, 1 - Low															

Assessment Pattern

Level No.	Skill Level	ISE I	ESE
S1	Imitation	10	10
S2	Manipulation	20	20
S3	Precision	10	10
S4	Articulation	10	10
55	Naturalization	00	00
Total Marks: 100		50	50

Assessment table

Assessment Tool	S1	S2
	CO1, CO2	CO2, CO3, CO4, CO5
Term Work (50 Marks)	24	26
Practical Examination & Viva Voce (50 Marks)	21	29
Total Marks: 100		

Special Instructions

None

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Bridge Courses for Exit

Option 1

The candidate should complete the internship for two months for 8 credits.

Option 2

Exit option: Award of UG Degree in Major and an additional 8 credits

#	Name	Credit	Mode
1	Certified Network Engineer	8	Online/Offline Certification Course. One Course Among the List Shall Be Done During Summer Vacation After Semester VI
2	Certified Cloud Engineer	8	
3	Certified Software Engineer	8	

Option 3

After the third year:

1. The candidate should pass the following two courses of 8 credits to qualify for a B. Voc. Degree.
2. Any two from the list of electives, except those registered earlier.

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