Detailed Program

Bachelor of Technology (B.Tech.)

Computer Science Engineering (CSE)

&

CSE with Specialization in AI and ML

Semester-VII

(2025-2029)

DOC202506200023

RNB GLOBAL UNIVERSITY

Educating stars for tomorrow

RNB GLOBAL UNIVERSITY

RNB Global City, Ganganagar Road,

Bikaner, Rajasthan 334601

OVERVIEW

RNB Global University follows Semester System. Accordingly, each academic year is divided into two semesters**, Odd (July-December) and Even (January-June)**. Besides this, the university follows a system of continuous evaluation along with regular updating in course curricula and teaching pedagogy.

The curriculum for B. Tech (CSE) Program along **for (July-December) Odd Semester 2028** with examination pattern is as follows:

Course Scheme

Semester -VII

S. No.	Course Code	Course Category	Course Title	L	T	P	Credits
1	DAPE99449	Research Project 1	Capstone Project	0	0	10	5
2	CSEC14400	DSC-26	Compiler Construction	3	0	0	3
3	CSEC14401	DSC-27	Artificial Intelligence	4	0	0	4
4		DSE-5	Elective-V	4	0	0	4
5		DSE-6	Elective-VI	4	0	0	4
6	VAC088030	VAC-2	Design Project	2	0	0	2
7	SEC077007	ASE-7	Ability & Skill Enhancement – VII	2	0	0	2
8	WHNN99000		Workshops/ Seminars/Human Values/ Social Service/NCC/NSS	-	-	-	1
		Total		**19**	**0**	**10**	**25**

ELECTIVE-V

S. No.	Course Code	Course Name	Credits
1	CSEE14021	Soft Computing	4
2	CSEE14022	**Mobile Computing (DSE-5)**	4
3	CSEE14023	Parallel and Distributed Computing	4
4	CSEE14024	Grid Computing	4
5	CSEE14025	Ubiquitous and Pervasive Computing	4
		Any Related MOOC Course	

ELECTIVE-VI

S. No.	Course Code	Course Name	Credits
1	CSEE14026	Natural Language Processing	4
2	CSEE14027	**Network Security and Cryptography (DSE-6)**	4
3	CSEE14028	Image Processing	4
4	CSEE14029	Multimedia Technologies	4
5	CSEE14030	System Programming	4
6	CSEE14031	Heterogeneous Computing with OpenCL	4
		Any Related MOOC Course	

SPECIALIZATION ELECTIVES FOR AI & MACHINE LEARNING

S. No.	Course Code	Course Name	L	T	P	Credits
1	CSEE14038	Data Mining Techniques and Applications **(E-V)**	4	0	0	4
2	CSEE14039	Optimization Techniques in Machine Learning **(E-VI)**	4	0	0	4
		Any Related MOOC Course				

EVALUATION SCHEME- THEORY

The evaluation of the theory paper of B.Tech would be based on Internal and External Assessments. Internal Assessment would consist of 50% of the marks (50 marks) and external assessment (in form of End Term Exam) would consist of remaining 50% marks (50 marks). Detailed scheme of Internal and External Assessments as follows:

Internal Assessment

The distribution of Internal Assessment Marks is as follows:

Type	Details	Marks
Mid Term	One Mid-term Sessional	25
Quiz	Quiz based on MCQs	5
Marks obtained in various Tests, Assignments, Presentations, Tutorials etc.	Average of Marks obtained	15
Academic Performance including Attendance	Eligibility >75% Attendance	5
TOTAL		**50**

External Assessment

Type	Marks
Theory	50

EVALUATION SCHEME -PRACTICAL

The evaluation of the practical paper of B.Tech would be based on Internal and External Assessments. Internal Assessment would consist of 50% of the marks (50 marks) and external assessment (in form of End Term Exam) would consist of remaining 50% marks (50 marks). Detailed scheme of Internal and External Assessment is as follows:

Internal Assessment

Type	Details	Marks
Marks obtained in various manuals, practical file, participation, any model prepared, output of practical	Average of marks obtained	45
Academic Performance including Attendance	Eligibility >75% Attendance	5
TOTAL	**50**	

External Assessment

Type	Marks
Practical	50

EVALUATION SCHEME- WORKSHOPS & SEMINARS & NCC/NSS

1. NCC/NSS will be completed from Semester I – Semester IV. It will be evaluated internally by the institute. The credit for this will be given at the end of each Semester.

2. The students have to join club/clubs with the active participation in different activities of club. The students would be continuously assessed from Semester-I to Semester-IV and credits and marks would be given after the end of each Semester.

Bachelor of Technology – CSE (Four Years Course)

1. Vision

To deliver a high-quality education that will produce engineers of the highest caliber, equipped with the newest information and cutting-edge concepts in computer science engineering to fulfil the demands of industry and society.

2. Mission

To create an academic setting for the growth of professionals equipped with the knowledge, abilities, values, and self-assurance to assume leadership positions in the field of computer science and engineering.

To promote a culture of research that produces knowledge and cutting-edge technologies that aid in society's sustainable development.

To improve academic collaborations for international exposure.

3. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To produce studentswith strong foundation of knowledge and skills in the field of computer science and engineering.

PEO2: To produce students who are employable in private/public sector/research organizations or work as an entrepreneur.

PEO3: To produce students who can provide solutions to problems in their profession by applying computer engineering theory and practices.

PEO4: To produce graduates who can provide leadership and are effective in multidisciplinary environment.

4. PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3: Design/Development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitation.

PO6: The engineer and society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

5. PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics and networking for efficient design of computer-based systems of varying complexity.

PSO2: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur and a zest for higher studies/employability in the field of Computer Science & Engineering.

PSO3: Cultivate the field of computing and its latest trends, to pursue teaching, research & development activities and to work effectively in a team.

6. **Course Outcomes**		
Course Codes & Course Names	**After completion of these courses' students should be able to**	
CSEC14400-Compiler Construction	**CO1:**	Explain Lambda Calculus to verify programs.
	CO2:	Apply parsing techniques and able to write Context Free Grammars for various languages.
	CO3:	Distinguish the various phases of a compiler.
	CO4:	Design the structure of intermediate code for various types of statements and expressions.
	CO5:	Identify tools to construct the machine independent code
CSEC14401-Artificial Intelligence	**CO1:**	Define the ontological engineering to plan a strategy to solve given problem.
	CO2:	Identify and apply suitable Intelligent agents for various AI applications.
	CO3:	Design smart system using different informed search / uninformed search or heuristic approaches.
	CO4:	Create the suitable algorithms to solve AI problems.
	CO5:	Apply knowledge representation, reasoning and machine learning techniques to real-time application systems
CSEE14022-Mobile Computing	**CO1:**	Explain the basics of mobile Computing
	CO2:	Describe the functionality of Mobile IP and Transport Layer
	CO3:	Classify different types of mobile telecommunication systems
	CO4:	Demonstrate the Adhoc networks concepts and its routing protocols
	CO5:	Make use of mobile operating systems in developing mobile applications
CSEE14027-Network Security & Cryptography	**CO1:**	Define the Encrypt and decrypt messages using block ciphers.
	CO2:	Demonstrate techniques to Sign and verify messages using well-known signature generation and verification algorithms.
	CO3:	Identify and classify computer and security threats and develop a security model to prevent, detect and recover from attacks.
	CO4:	Develop code to implement a cryptographic algorithm or write an analysis report on any existing security product.
	CO5:	Design a network security system by implementing all the concepts of encryption and decryption algorithms
DAPE99449-Capstone Project	**CO1:**	Explain the work as a responsible member and possibly a leader of a team in developing software solutions.

	CO2:	Experiment with technical and behavioral ideas and thought in oral settings.
	CO3:	Test for the conformance of the developed prototype against the original requirements of the problem.
	CO4:	Formulate a real-world problem and develop its requirements develop a design solution for a set of requirements.
	CO5:	Able to apply the engineering and management principles to achieve the goal of the project
VAC088030-Design Project	**CO1:**	Summarize the guidelines, suggestions and scope regarding companies.
	CO2:	Plan the interacting lectures with the industrial experts.
	CO3:	Explain the importance of internship program.
	CO4:	Improve the quality to choose the best company for the career.
	CO5:	Create a clear understanding of industry trends and advancements

Electives:

CSEE14021-Soft Computing	**CO1:**	Understand fundamental concepts of soft computing
	CO2:	Explain the working principles of neural networks.
	CO3:	Apply fuzzy logic techniques to solve real-world problems.
	CO4:	Analyze evolutionary algorithms for optimization problems.
	CO5:	Develop hybrid soft computing models for specific applications

CSEE14023-Parallel and Distributed Computing	**CO1:**	Understand fundamental concepts of parallel and distributed computing.
	CO2:	Explain parallel architectures and programming models.
	CO3:	Apply parallel programming techniques for performance optimization
	CO4:	Analyze distributed computing models and fault tolerance techniques
	CO5:	Evaluate distributed system security and real-world applications.

CSEE14024-Grid Computing	**CO1:**	Understand fundamental concepts and applications of grid computing
	CO2:	Explain grid computing architecture and middleware technologies.
	CO3:	Apply grid security mechanisms and resource management techniques
	CO4:	Analyze grid middleware and scheduling algorithms.
	CO5:	Evaluate real-world grid computing applications and future trends.

CSEE14025-Ubiquitous and Pervasive Computing	**CO1:**	Understand the principles and applications of ubiquitous and pervasive computing
	CO2:	Explain context-aware and adaptive computing techniques
	CO3:	Apply communication and middleware solutions for pervasive environments
	CO4:	Analyze security, privacy, and ethical concerns in ubiquitous computing
	CO5:	Evaluate real-world applications and emerging trends in pervasive computing

CSEE14026-Natural Language Processing	**CO1:**	Understand the fundamental concepts and challenges of NLP
	CO2:	Explain various linguistic analysis techniques such as tokenization, POS tagging, and NER
	CO3:	Apply syntactic and semantic processing techniques to NLP problems
	CO4:	Analyze different machine learning and deep learning models used in NLP
	CO5:	Evaluate NLP applications such as sentiment analysis, translation, and chatbots

CSEE14028-Image Processing	**CO1:**	Understand the fundamental concepts and techniques of image processing
	CO2:	Apply image enhancement and restoration techniques in spatial and frequency domains
	CO3:	Analyze segmentation and feature extraction methods for object detection
	CO4:	Implement morphological image processing and compression algorithms
	CO5:	Evaluate real-world applications of image processing in various domains

CSEE14029-Multimedia Technologies	**CO1:**	Understand the fundamental concepts and applications of multimedia
	CO2:	Analyze different multimedia components such as images, audio, and video
	CO3:	Apply compression techniques for efficient multimedia storage and transmission
	CO4:	Evaluate multimedia networking, storage, and security mechanisms
	CO5:	Design and develop interactive multimedia applications

CSEE14030-System Programming	**CO1:**	Understand the fundamental concepts of system programming
	CO2:	Analyze the functioning of assemblers, loaders, and linkers
	CO3:	Apply macro processors and compiler techniques in system development
	CO4:	Implement process management and inter-process communication techniques
	CO5:	Develop system-level programs using C and assembly language

CSEE14031-Heterogeneous Computing with OpenCL	**CO1:**	Understand the fundamentals of heterogeneous computing and OpenCL
	CO2:	Analyze OpenCL programming models and execution platforms
	CO3:	Develop parallel applications using OpenCL kernels
	CO4:	Optimize OpenCL programs for performance improvements
	CO5:	Implement OpenCL-based solutions for real-world applications

CSEE14038-Data Mining Techniques and Applications	**CO1:**	Understand the fundamental concepts and importance of data mining
	CO2:	Apply data preprocessing and feature selection techniques
	CO3:	Implement classification and prediction models
	CO4:	Perform clustering and association rule mining techniques
	CO5:	Explore advanced applications of data mining in real-world domains.

CSEE14039-Optimization Techniques in Machine Learning	**CO1:**	Understand the basic concepts of optimization and its applications in machine learning
	CO2:	Apply gradient-based optimization algorithms in machine learning
	CO3:	Implement second-order optimization methods and compare them with first-order methods.
	CO4:	Solve convex optimization problems and understand their relevance in machine learning
	CO5:	Utilize optimization techniques in real-world machine learning applications

7. CO PO Mapping

CSEC14400	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		2		3	3	3	3	3	2	3
CO2	3		3	2	3	2	2	3		2		3
CO3		2	2		3						3	
CO4	2	2	3	2	3				3	3	3	3
CO5	2			3		3	3	2	2		2	2

CSEC14401	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2			3		3		2	3
CO2	2	3		3	3		3	3	2	3	3	3
CO3	2		2		2	3			3		3	
CO4		2	3		2		3	2	3	2	3	3
CO5	3			3		3		3		3		2

CSEE14022	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2			3	3	3	3	2	3
CO2	3			3	2		3	3	2	3		3
CO3	2	2	2		3	3					3	
CO4		2	3	2	2	3	3	2	3	2	3	3
CO5	3			3		2				3		2

CSEE14027	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2			3	3		3	2	3
CO2	2	3			2		3	3	2	3	2	3
CO3	3		2	3	2	3			3		3	3
CO4		2	3	2	3	3		3	3	2	3	
CO5	2	2		2			3					3

DAPE99449	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2			3	3	3	3		3	3
CO2	2	2		2	3	3	3	3	3	3		3
CO3	2		2	3						3	3	
CO4		3	2	2	3				3		3	3
CO5	3					2	2	3		2	2	2

VAC088030	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2			3	3		3	2	3
CO2	3	3	3		2		3	3	2	3		3
CO3	2		2	3	3	3			3		3	
CO4		2	3	3	3	3	3	3	3	2	3	3
CO5	3			2		2				3	2	2

CSEE14021	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2			3	3	3	3	3	3	3
CO2	2	2	3	2	3	3	3	3		3	3	3
CO3		2		3	3				3	3		3
CO4	3	3	2	2	3				3		3	3
CO5	2	2	3	1		2	3	3	2	1	2	1

CSEE14023	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2			3	3	3	3	3	3	3
CO2	2	2	3	2	3	3	3	3		3	3	3
CO3		2		3	3				3	3		3
CO4	3	3	2	2	3				3		3	3
CO5	2	2	3	1		2	3	3	2	1	2	1

CSEE14024	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2			3	3	3	3	3	3	3
CO2	2	2	3	2	3	3	3	3		3	3	3
CO3		2		3	3				3	3		3
CO4	3	3	2	2	3				3		3	3
CO5	2	2	3	1		2	3	3	2	1	2	1

CSEE14025	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2			3	3	3	3	3	3	3
CO2	2	2	3	2	3	3	3	3		3	3	3
CO3		2		3	3				3	3		3
CO4	3	3	2	2	3				3		3	3
CO5	2	2	3	1		2	3	3	2	1	2	1

CSEE14026	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2			3	3	3	3	3	3	3
CO2	2	2	3	2	3	3	3	3		3	3	3
CO3		2		3	3				3	3		3
CO4	3	3	2	2	3				3		3	3
CO5	2	2	3	1		2	3	3	2	1	2	1

CSEE14028	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2			3	3	3	3	3	3	3
CO2	2	2	3	2	3	3	3	3		3	3	3
CO3		2		3	3				3	3		3
CO4	3	3	2	2	3				3		3	3
CO5	2	2	3	1		2	3	3	2	1	2	1

CSEE14029	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2			3	3	3	3	3	3	3
CO2	2	2	3	2	3	3	3	3		3	3	3
CO3		2		3	3				3	3		3
CO4	3	3	2	2	3				3		3	3
CO5	2	2	3	1		2	3	3	2	1	2	1

CSEE14030	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2			3	3	3	3	3	3	3
CO2	2	2	3	2	3	3	3	3		3	3	3
CO3		2		3	3				3	3		3
CO4	3	3	2	2	3				3		3	3
CO5	2	2	3	1		2	3	3	2	1	2	1

CSEE14031	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2			3	3	3	3	3	3	3
CO2	2	2	3	2	3	3	3	3		3	3	3
CO3		2		3	3				3	3		3
CO4	3	3	2	2	3				3		3	3
CO5	2	2	3	1		2	3	3	2	1	2	1

CSEE14038	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2			3	3	3	3	3	3	3
CO2	2	2	3	2	3	3	3	3		3	3	3
CO3		2		3	3				3	3		3
CO4	3	3	2	2	3				3		3	3
CO5	2	2	3	1		2	3	3	2	1	2	1

CSEE14039	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2			3	3	3	3	3	3	3
CO2	2	2	3	2	3	3	3	3		3	3	3
CO3		2		3	3				3	3		3
CO4	3	3	2	2	3				3		3	3
CO5	2	2	3	1		2	3	3	2	1	2	1

8. Curriculum

Course Name: Compiler Construction

Course Outline **Course Code: CSEC14400**

Unit I : Compilers: Grammars and Automata

Languages – Grammars – Types of grammars – Context free grammar - regular expression - Recognizing of patterns - finite automation (deterministic & non deterministic) Conversion of NDFA to DFA - Conversion of regular expression of NDFA – Thompson's construction- minimization of NDFA - Derivation - parse tree - ambiguity – Lexical analysis- handles - token specification - design of lexical analysis (LEX) - Automatic generation of lexical analyzer - input buffering - A language for specifying lexical analyzers - implementation of lexical analyzer

Unit II: Syntax Analysis- Parsing

Definition - role of parsers - top down parsing - bottom-up parsing - Left recursion - left factoring - Handle pruning, Shift reduce parsing - operator precedence parsing – FIRST- FOLLOW- LEADING- TRAILING- Predictive parsing - recursive descent parsing. LR parsing – LR (0) items - SLR parsing – Canonical LR - LALR parsing - generation of LALR - Ambiguous grammars - error recovery.

Unit III: Syntax Directed Translation & Code Optimization

Intermediate Languages - prefix - postfix - Quadruple - triple - indirect triples – syntax tree- Evaluation of expression - three-address code- Synthesized attributes – Inherited attributes – Conversion of Assignment statements- Boolean expressions –Backpatching - Declaration - CASE statements.

Unit IV: Code optimization

Local optimization- Loop Optimization techniques – DAG – Dominators- Flow graphs – Storage allocations- Peephole optimization – Issues in Code Generation.

Suggested Readings:

1. Aho A. V., Ullman J. D., Sethi R., Compilers Principles, Techniques and Tools, Pearson Education (2005).
2. John Levine, Tony Mason, Doug Brown, Lex and Yacc, O'REILLY (1992)
3. Kenneth C. Louden, Compiler Construction and Practice, Thomson Publication, 1997.
4. Dhamdhere, Compiler Construction, Macmillan Publication.

Course Name: Artificial Intelligence

Course Code: CSEC14401

Course Outline

Unit I: Introduction and Overview

Introduction, Importance of AI and Applications of AI.

Problem Solving Techniques: Problem state spaces, problem characteristics, production system, Search space control: Uninformed search- Depth first search, Breadth first search, Depth first search with iterative deepening, Heuristic search – Simple Hill Climbing, Steepest ascent Hill Climbing, A* algorithm, AO* algorithm, Min-max search procedure for game playing, Alpha beta cutoffs.

Unit II: Knowledge Representation

Propositional and predicate logic, resolution in predicate logic, question answering, theorem proving. Semantic networks, Frames and scripts, conceptual graphs, conceptual dependencies.

Unit III: Knowledge acquisition

Types of learning, General learning models, learning Automata, Intelligent Editors, Learning by Induction. **Introduction to:** Expert Systems, Pattern recognition, Natural Language Processing, Evolutionary algorithm, Fuzzy logic, Neural Networks.

Unit IV: Languages for AI Problem Solving

Introduction to Prolog- syntax and data structures, representing objects and relationships, built in predicates. Introduction to LISP- basic and intermediate LISP programming.

Suggested Readings

1. Rich E., Artificial Intelligence, Tata McGraw Hills.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education Asia.
3. D.W. Patterson, Introduction to AI and Expert Systems, PHI.
4. N.J. Nilsson, Principles of Artificial Intelligence, Kaufmann,1980
5. Saroj Kaushik, Logic and Prolog Programming, New Age International Publications.
6. PH. Winston, Artificial Intelligence, Addison Wesley.

Course Name: Mobile Computing

Course Code: CSEE14022

Course Outline

Unit I Introduction

Introduction to Mobile Computing — Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing — Spread spectrum -MAC Protocols — SDMA- TDMA- FDMA- CDMA

Unit II Mobile Telecommunication System

Introduction to Cellular Systems — GSM — Services & Architecture — Protocols — Connection Establishment — Frequency Allocation — Routing — Mobility Management — Security — GPRS- UMTS — Architecture — Handover — Security

Unit III Mobile Network Layer

Mobile IP — DHCP — AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols — DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) –MANET Vs VANET — Security.

Unit IV Mobile Transport And Application Layer

Mobile TCP– WAP — Architecture — WDP — WTLS — WTP –WSP — WAE — WTA Architecture
— WML

Unit V Mobile Platforms And Applications

Mobile Device Operating Systems — Special Constraints & Requirements — Commercial Mobile Operating Systems — Software Development Kit: iOS, Android, BlackBerry, Windows Phone — MCommerce — Structure — Pros & Cons — Mobile Payment System — Security Issues

Suggested Readings:

1. MobileComputingTechnology,Applications and service creation,Asoke K Telukder, Roopa R Yavagal by TMH.
2. MobileComputing Theory and Practice-Kumkum Garg-Pearson

Course Name: Network Security & Cryptography

Course Code: CSEE14027

Course Outline

Unit I: Introduction
Terminologies, Architecture, Security - Attacks, Services and Mechanism.

Unit II: Symmetric Cryptography
Classical techniques, Block Ciphers – DES, Triple DES, AES; Stream Ciphers – RC4.

Unit III: Asymmetric Cryptography
Public key, RSA, Diffie Hellman. **Data Integrity:** Hash functions - SHA-1, HMAC; Digital signatures.

Unit IV: Key Management & Distribution
Kerberos. **Network Security:** SSL, TLS, HTTPS, SSH, PGP, IPsec.

Unit V: Information Security
IDS, Viruses & Worms, and Attacks & Firewalls**.**

Suggested Readings:

1. William Stallings, Cryptography and Network Security, Prentice Hall.
2. Alfred J. Meneze, Handbook of Applied Cryptography, CRC Press.
3. Roberta Bragg, Network Security - The Complete Reference, McGraw Hill.

Course Name: Ability & Skill Enhancement-VII

Course Code: SEC077007

Course Outline

Unit I: Self-Management
Self-Introduction–Expressing Confidently, SWOT Analysis Identifying One's Strengths and Weakness Impromptu speech (welcome, thank you, introducing others) – tackling hesitation, shyness and nervousness in speaking.
Unit II: Workplace Communication
Email Etiquette - Email Message, Netiquette Guidelines
Letter Writing- Job application, introduction, reference, thank you, follow up, appreciation letter.**Effective Presentations-** Enhancing presentations with slides and other Audio-visual aids - Art of Delivering the presentation.
Unit III: Interview and Group Discussion Skills
Different types of Interview format- answering questions- offering information- mock interviews-body language (paralinguistic features)- articulation of sounds- intonation.
Topic Based group discussion, Case based group discussion.
Unit IV: Public Speaking
a. Prepared speech (topics are given in advance; students get 10 minutes to prepare the speech and 5 minutes to deliver.
b. Extempore speech (students deliver speeches spontaneously for 5 minutes each on a given topic)
c. Story telling (Student narrates a fictional or real-life story for 5 minutes each)
Unit V: English Language Proficiency Test
English proficiency test in the language lab

Suggested Readings:

- Sarvesh Gulati (2012), Corporate Grooming and Etiquette, Rupa Publications India Pvt. Ltd.
- Bovee, Courtland L, Thill, John V. and Abha Chatterjee (2011). *Business Communication Today*, 10/e; New Delhi: Pearson
- Basic Managerial Skills for All by E. H. McGrath, S. J., PHI

Course Name: Soft Computing

Course Code: CSEE14021

Course Outline

Unit I: Introduction to Soft Computing

Concept and Importance of Soft Computing, Differences between Hard Computing and Soft Computing, Components of Soft Computing: Neural Networks, Fuzzy Logic, Genetic Algorithms

Unit II: Artificial Neural Networks

Biological Neurons and Artificial Neurons, Activation Functions: Sigmoid, ReLU, Tanh, etc., Feedforward Neural Networks, Backpropagation Algorithm,Supervised and Unsupervised Learning,Deep Learning Basics

Unit III: Fuzzy Logic and Fuzzy Systems

Fuzzy Sets, Membership Functions,Fuzzy Logic Operations,Fuzzy Inference Systems (Mamdani and Sugeno) Defuzzification Methods, Applications of Fuzzy Logic

Unit IV: Evolutionary Algorithms

Introduction to Genetic Algorithms (GA),Operators of GA: Selection, Crossover, Mutation,Swarm Intelligence: Ant Colony Optimization, Particle Swarm Optimization, Applications of Evolutionary Computing

Unit V: Hybrid Approaches and Applications

Neuro-Fuzzy Systems, Genetic-Fuzzy Systems, Applications in Pattern Recognition, Optimization, Control Systems, Case Studies on Soft Computing Techniques

Course Name: Parallel and Distributed Computing

Course Code: CSEE14023

Course Outline

Unit I: Introduction to Parallel and Distributed Computing

Definition and Scope, Differences between Parallel and Distributed Computing, Parallelism and Concurrency, Applications and Challenges

Unit II: Parallel Computing Models and Architectures

Flynn's Taxonomy: SISD, SIMD, MISD, MIMD, Shared Memory vs. Distributed Memory Models, Multicore and Manycore Architectures, GPU and FPGA-based Computing

Unit III: Parallel Programming and Performance

Parallel Programming Models: Message Passing (MPI), Shared Memory (OpenMP), Synchronization and Deadlocks, Speedup, Scalability, and Amdahl's Law, Performance Evaluation Metrics

Unit IV: Distributed Systems and Algorithms

Distributed Computing Models and Architectures, Communication Mechanisms: RPC, RMI, Sockets, Distributed File Systems (HDFS, Google File System), Consensus Algorithms (Paxos, Raft)

Unit V: Fault Tolerance, Security, and Applications

Fault Tolerance Techniques in Distributed Systems, Security Challenges and Solutions, Cloud Computing and Edge Computing, Case Studies in Distributed Computing (Hadoop, Kubernetes)

Course Name: Grid Computing

Course Code: CSEE14024

Unit I: Introduction to Grid Computing

Definition and Scope of Grid Computing, Evolution of Grid Computing, Grid vs. Cluster Computing, Applications of Grid Computing

Unit II: Grid Computing Architecture

Layered Architecture of Grid Computing, Service-Oriented Architecture (SOA) in Grid Computing, Grid Middleware and Protocols, OGSA (Open Grid Services Architecture) and OGSI

Unit III: Grid Security and Resource Management

Security Challenges in Grid Computing, Authentication, Authorization, and Access Control, Resource Management and Scheduling in Grid Computing, Grid Resource Allocation Policies

Unit IV: Grid Middleware and Frameworks

Overview of Grid Middleware (Globus Toolkit, Condor, Unicore), Data Management in Grid Computing, Grid Portals and User Interfacesm,Case Study: Globus Toolkit Architecture

Unit V: Grid Computing Applications and Future Trends

Scientific Applications of Grid Computing (Healthcare, Weather Prediction), Grid Computing in Business and Industry, Cloud and Grid Computing Integration, Future Directions and Research Areas

Course Name: Ubiquitous and Pervasive Computing

Course Code: CSEE14025

Unit I: Introduction to Ubiquitous and Pervasive Computing

Definition and Evolution of Ubiquitous Computing,Pervasive Computing vs. Ubiquitous Computing, Key Characteristics and Challenges, Applications of Ubiquitous Computing

Unit II: Context-Aware and Adaptive Systems

Context-Aware Computing: Sensing, Modeling, and Reasoning, Context Acquisition and Representation, Adaptation Techniques in Pervasive Computing, Case Studies on Context-Aware Systems

Unit III: Communication Technologies and Middleware

Wireless Communication: Bluetooth, ZigBee, NFC, Wi-Fi,Mobile and Wearable Computing, Middleware for Pervasive Computing (MobiComp, Gaia, Aura), Service Discovery and Device Interoperability

Unit IV: Security, Privacy, and Trust in Pervasive Computing

Security Challenges in Ubiquitous Systems, Privacy-Preserving Techniques, Trust Models in Pervasive Environments, Ethical and Legal Issues

Unit V: Applications and Future Trends

Ubiquitous Computing in Smart Homes, Healthcare, and Smart Cities, Human-Computer Interaction in Pervasive Systems, Internet of Things (IoT) and Ubiquitous Computing Integration, Future Research Directions

Course Name: Natural Language Processing
Course Code: CSEE14026

Unit I: Introduction to Natural Language Processing

Definition and Applications of NLP, Challenges in NLP, NLP Pipeline and Processing Steps, Role of Machine Learning and Deep Learning in NLP

Unit II: Text Processing and Linguistic Analysis

Tokenization and Lemmatization, Part-of-Speech (POS) Tagging, Named Entity Recognition (NER)Stemming and Chunking

Unit III: Syntactic and Semantic Processing

Context-Free Grammar (CFG) and Parsing Techniques, Dependency Parsing and Constituency Parsing, Word Sense Disambiguation (WSD), Semantic Role Labeling

Unit IV: Machine Learning and Deep Learning for NLP

Traditional ML Algorithms for NLP (Naïve Bayes, SVM, HMM), Word Embeddings (Word2Vec, GloVe, FastText), Recurrent Neural Networks (RNNs) and Long Short-Term Memory (LSTM) Networks, Transformer Models (BERT, GPT, T5)

Unit V: Advanced Applications of NLP

Sentiment Analysis and Opinion Mining,Machine Translation and Text Summarization, Chatbots and Conversational AI, Speech Recognition and Text-to-Speech

Course Name: Image Processing
Course Code: CSEE14028

Unit I: Introduction to Image Processing

Digital Image Fundamentals, Image Representation and Formats, Elements of Visual Perception, Sampling, Quantization, and Image Acquisition

Unit II: Image Enhancement and Restoration

Spatial Domain Enhancement Techniques, Frequency Domain Enhancement (Fourier Transform, DFT, FFT), Noise Reduction and Filtering (Gaussian, Median, Adaptive Filters), Image Restoration (Inverse Filtering, Wiener Filtering)

Unit III: Image Segmentation and Feature Extraction

Edge Detection (Sobel, Prewitt, Canny),Thresholding (Global, Adaptive, Otsu's Method), Region-Based Segmentation (Watershed, Region Growing), Feature Extraction (SIFT, SURF, HOG, LBP)

Unit IV: Morphological Processing and Image Compression (

Morphological Operators (Dilation, Erosion, Opening, Closing), Hit-or-Miss Transformations, Image Compression Techniques (Lossless and Lossy), JPEG, PNG, Huffman Coding, Run-Length Encoding

Unit V: Applications of Image Processing

Object Detection and Recognition,Image Classification using Machine Learning, Medical Image Processing, Remote Sensing and Biometrics

Course Name: Multimedia Technologies
Course Code: CSEE14029

Unit I: Introduction to Multimedia

Definition and Components of Multimedia, Multimedia Applications in Various Domains, Hardware and Software Requirements for Multimedia Systems, Data Representations: Text, Images, Audio, Video, Animation

Unit II: Image, Audio, and Video Processing

Image Fundamentals and Color Models (RGB, CMYK, HSV), Image File Formats (JPEG, PNG, GIF, TIFF),Audio Representation, Sampling, and Quantization, Audio Formats (MP3, WAV, AAC),Video Representation, Frame Rate, and Resolution, Video File Formats (MPEG, AVI, MP4, MKV)

Unit III: Multimedia Compression Techniques

Lossless Compression (Huffman, Run-Length Encoding), Lossy Compression (JPEG, MP3, MPEG), Image and Video Compression Standards (JPEG2000, H.264, H.265),Audio Compression Techniques

Unit IV: Multimedia Networking, Storage, and Security

Multimedia Networking: Streaming, Protocols (RTP, RTSP), Cloud-Based Multimedia Storage Solutions, Digital Rights Management (DRM) and Copyright Issues, Multimedia Security: Watermarking, Encryption Techniques

Unit V: Interactive Multimedia Applications

Web-Based Multimedia (HTML5, WebGL, CSS3 Animations), Virtual Reality (VR) and Augmented Reality (AR), Multimedia in E-Learning and Gaming, Case Studies on Real-World Multimedia Applications

Course Name: System Programming
Course Code: CSEE14030

Unit I: Introduction to System Programming

System Software vs. Application Software, Components of System Programming, Machine Structure and System Programs, Operating System as a System Program

Unit II: Assemblers, Loaders, and Linkers

Assembly Language and Assemblers (Single-Pass & Two-Pass), Symbol Table, Parsing, and Pass Structures, Loaders and Linkers: Design and Working Mechanisms, Relocatable and Absolute Loaders

Unit III: Macro Processors and Compilers

Macro Definition, Expansion, and Processing, Implementation of Macro Processor, Introduction to Compilers and Interpreters, Lexical Analysis, Parsing, Syntax Analysis

Unit IV: Process Management and Inter-Process Communication (IPC)

Process Scheduling and Synchronization, Deadlocks: Prevention and Avoidance, IPC Mechanisms: Shared Memory, Message Passing, Pipes, Sockets, System Calls for Process and File Management

Unit V: System Programming with C and Assembly

Low-Level File Handling in C, Shell Scripting and Process Management in UNIX/Linux, Assembly Language Programming for System Tasks, Case Studies: Writing a Simple Shell, Emulator Design

Course Name: Heterogeneous Computing with OpenCL
Course Code: CSEE14031

Unit I: Introduction to Heterogeneous Computing and OpenCL

Overview of Heterogeneous Computing, Introduction to OpenCL: Goals and Features, OpenCL vs CUDA and Other Parallel Programming Models, OpenCL Platform Model, Execution Model, and Programming Model

Unit II: OpenCL Architecture and Programming

OpenCL Devices, Compute Units, and Processing Elements, OpenCL Context, Command Queues, and Buffers, Writing and Executing OpenCL Kernels, Memory Model in OpenCL: Global, Local, Constant, and Private Memory

Unit III: OpenCL Host and Kernel Programming

Setting Up the OpenCL Environment, Writing OpenCL Programs: Host and Kernel Code, Building and Executing OpenCL Kernels, Workgroups, Work Items, and NDRange Execution

Unit IV: Performance Optimization and Debugging

Performance Considerations in OpenCL, Memory Coalescing, Bank Conflicts, and Data Locality, Profiling and Debugging OpenCL Applications, OpenCL on Multi-core CPUs, GPUs, and FPGAs

Unit V: Real-World Applications and Advanced Topics

Case Studies: OpenCL in Scientific Computing, Image Processing, and AI, OpenCL for Embedded and Mobile Devices, OpenCL and Vulkan Compute, Future Trends in Heterogeneous Computing

Course Name: - Data Mining Techniques and Applications
Course Code: CSEE14038

Course Outline:

Unit-I: Data Warehousing: Introduction, what is Data Warehouse? Definition, Multidimensional Data Model, OLAP Operations, Warehouse Schema, Data Warehouse Architecture, Warehouse Server, Metadata, OLAP Engine, Data Warehouse Backend Process, Other Features Data Preprocessing, Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

Unit-II: Data Mining: What is Data Mining? Data Mining: Definitions, KDD vs Data Mining, DBMS vs DM, Other Related Areas, DM Techniques, Other Mining Techniques, Issues and Challenges in DM, DM Applications- Case Studies

Unit-III: Clustering Techniques: Clustering Paradigms, Partitioning Algorithms, k-Medoid Algorithms, CLARA, CLARANS, Hierarchical Clustering, DBSCAN, BIRCH, CURE, Categorical Clustering Algorithms, STIRR, ROCK, CACTUS

Unit-IV: Decision Trees: What is a Decision Tree? Tree Construction Principle, Best Split, Splitting Indices, Splitting Criteria, Decision Tree Construction Algorithms, CART, ID3, C4.5, Decision Tree Construction with Presorting, Rainforest, Approximate Methods, CLOUDS, BOAT, Pruning Techniques, Integration of Pruning and Construction, Ideal Algorithm

Course Name: Optimization Techniques in Machine Learning
Course Code: CSEE14039

Course Outline:

Unit-I: Basics of Nonlinear Optimization • Convex sets, convex functions. • Introduction to unconstrained and constrained optimization problems. • Examples of nonlinear optimization problems: Matrix completion, matrix factorization, least squares, logistic regression, sparse principal component analysis, expectation maximization.

Unit-II: Gradient descent (GD) algorithm • Geometric interpretation. • Why GD work and when it does not work. • Strong convexity and condition numbers, choice of step size. • First-order optimality conditions for unconstrained problems. • Projected GD for constrained problems. Frank-Wolfe algorithm.

Unit-III: Momentum acceleration • Nesterov and Polyak's momentum techniques, Adam, AdaGrad algorithms. • Geometric interpretation.

Unit-IV: Duality theory • Lagrangians, duality theory, KKT conditions. • Examples from support vector machines, constrained least squares. Empirical risk minimization • Risk minimization problems, overfitting. • Sample average approximation (SAA)

8. Lesson Plans

CSEC14400– Compiler Construction

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Languages	C-1	Lecture
Unit-I	Grammars – Types of grammars – Context free grammar	C-2	Lecture
Unit-I	Regular expression - Recognizing patterns - finite automation (deterministic & nondeterministic)	C-3	Lecture
Unit-I	Conversion of NDFA to DFA	C-4	Lecture
Unit-I	Conversion of regular expression of NDFA	C-5	Lecture
Unit-I	Thompson's construction- specification	C-6	Lecture
Unit-I	Design of lexical analysis (LEX) - Automatic generation of lexical analyzer - input buffering	C-7	Lecture
Unit-I	A language for specifying lexical analyzers - implementation of lexical analyzer	C-8	Lecture
Unit-I	Clarification Class-1	C-9	Clarification Class
Unit-I	Classroom Assignment-1	C-10	Classroom Assignment
	Presentation-1	C-11	Presentation
Unit-II	Definition - role of parsers - top down parsing - bottom-up parsing - Left recursion – left factoring	C-12	Lecture
Unit-II	Shifts reduce parsing	C-13	Lecture
Unit-II	Handle pruning	C-14	Lecture
Unit-II	operator precedence parsing -FIRST- FOLLOW- LEADING- TRAILING	C-15	Lecture
Unit-II	Predictive parsing - recursive descent parsing	C-16	Lecture
Unit-II	LR parsing – LR (0) items - SLR parsing	C-17	Lecture
Unit-II	Canonical LR	C-18	Lecture
Unit-II	LALR parsing - generation of LALR	C-19	Lecture
Unit-II	Ambiguous grammar - error recovery	C-20	Lecture
Unit-II	Clarification Class-2	C-21	Clarification Class
Unit-II	Classroom Assignment-2	C-22	Classroom Assignment
	Take Home Assignments-1		Take Home Assignments
	Presentation-2	C-23	Presentation
	Guest Lecture	C-24	Guest lecture
Unit-III	Intermediate Languages - prefix - postfix	C-25	Lecture
Unit-III	Quadruple - triple - indirect triples	C-26	Lecture
Unit-III	Syntax tree- Evaluation of expression	C-27	Lecture
Unit-III	Three-address code- Synthesized attributes - Inherited attributes	C-28	Lecture
Unit-III	Conversion of Assignment statements	C-29	Lecture
Unit-III	Boolean expressions	C-30	Lecture

Unit-III	Backpatching	C-31	Lecture
Unit-III	Declaration - CASE statements	C-32	Lecture
Unit-III	Clarification Class-3	C-33	Clarification Class
Unit-III	Classroom Assignment-3	C-34	Class Room Assignment
	Take Home Assignments-2		Take Home Assignments
	Presentation-3	C-35	Presentation
	Workshop	C-36	Workshop
Unit-IV	Local optimization- Loop Optimization techniques	C-37	Lecture
Unit-IV	DAG	C-38	Lecture
Unit-IV	Dominators- Flow graphs	C-39	Lecture
Unit-IV	Classroom Assignment-4	C-40	Classroom Assignment
Unit-IV	Presentation-4	C-41	Presentation
Unit-IV	Storage allocations	C-42	Lecture
Unit-IV	Peephole optimization	C-43	Lecture
Unit-IV	Issues in Code Generation	C-44	Lecture
Unit-IV	Clarification Class-4	C-45	Clarification Class

CSEC14401– Artificial Intelligence

Unit	Particulars	Class No.	Pedagogy of Class
Unit- I	Introduction and Overview		
Unit- I	Introduction	C-1	Lecture
Unit- I	Importance of AI and Applications of AI	C-2	Lecture
Unit- I	Problem Solving Techniques: Problem state spaces	C-3	Lecture
Unit- I	Problem characteristics	C-4	Lecture
Unit- I	Production System	C-5	Lecture
Unit- I	Search space control: Uninformed search- Depth first search	C-6	Lecture
Unit- I	Breadth first search	C-7	Lecture
Unit- I	Depth first search with iterative deepening	C-8	Lecture
Unit- I	Heuristic search	C-9	Lecture
Unit- I	Simple Hill Climbing, Steepest ascent Hill Climbing	C-10	Lecture
Unit- I	A* algorithm	C-11	Lecture
Unit- I	AO* algorithm	C-12	Lecture
Unit- I	Min-max search procedure for game playing	C-13	Lecture
Unit- I	Alpha beta cutoffs	C-14	Lecture
Unit- I	Clarification Class	C-15	Clarification Class
Unit- I	Classroom Assignment	C-16	Classroom Assignment
Unit- II	Knowledge Representation		
Unit- II	Propositional and predicate logic	C-17	Lecture
Unit- II	Resolution in predicate logic	C-18	Lecture
Unit- II	Question answering	C-19	Lecture
Unit- II	Theorem proving	C-20	Lecture
Unit- II	Semantic networks	C-21	Lecture
Unit- II	Frames and scripts	C-22	Lecture
Unit- II	Conceptual graphs	C-23	Lecture
Unit- II	Conceptual dependencies	C-24	Lecture
Unit- II	Webinar	C-25	Webinar
Unit- II	Clarification Class	C-26	Clarification Class
Unit- II	Class Room Assignment	C-27	Class Room Assignment
Unit- II	Take Home Assignment		Take Home Assignment
Unit- II	Presentation	C-28	Presentation
	Guest lecture	C-29	Guest lecture
Unit-III	Knowledge acquisition		
Unit-III	Types of learning	C-30	Lecture
Unit-III	General learning models	C-31	Lecture
Unit-III	learning Automata	C-32	Lecture
Unit-III	Intelligent Editors	C-33	Lecture
Unit-III	Learning by Induction	C-34	Lecture
Unit-III	Introduction to: Expert Systems	C-35	Lecture
Unit-III	Pattern recognition	C-36	Lecture
Unit-III	Natural Language Processing-	C-37	Lecture

Unit-III	Evolutionary algorithm	C-38	Lecture

Unit-III	Fuzzy logic	C-39	Lecture
Unit-III	Neural Networks	C-40	Lecture
Unit-III	Webinar	C-41	Webinar
Unit-III	Clarification Class	C-42	Clarification Class
Unit-III	Classroom Assignment	C-43	Class Room Assignment
Unit-III	Take Home Assignment		Take Home Assignment
Unit-III	Presentation	C-44	Presentation
	Guest lecture	C-45	Guest lecture
Unit -IV	Languages for AI Problem Solving		
Unit -IV	Introduction to Prolog- syntax and data structures	C-46	Lecture
Unit -IV	Representing objects and relationships	C-47	Lecture
Unit -IV	Built in predicates	C-48	Lecture
Unit -IV	Introduction to LISP- basic and intermediate LISP programming	C-49	Lecture
Unit -IV	Introduction to LISP- basic and intermediate LISP programming	C-50	Lecture
Unit -IV	Introduction to LISP- basic and intermediate LISP programming	C-51	Lecture
Unit -IV	Introduction to LISP- basic and intermediate LISP programming	C-52	Lecture
Unit -IV	Introduction to LISP- basic and intermediate LISP programming	C-53	Lecture
Unit -IV	Introduction to LISP- basic and intermediate LISP programming	C-54	Lecture
Unit -IV	Clarification Class	C-55	Clarification Class
Unit -IV	Classroom Assignment	C-56	Classroom Assignment
Unit -IV	Take Home Assignment		Take Home Assignment
Unit -IV	Presentation	C-57	Presentation
	Presentation	C-58	Presentation
	Webinar	C-59	Webinar
	Seminar	C-60	Seminar

CSEE14022 – Mobile Computing

Unit	Particulars	Class No.	Pedagogy of Class
UNIT-I	Introduction to Mobile Computing		
Unit-I	Applications of Mobile Computing	C-1	Lecture
Unit-I	Generations of Mobile Communication Technologies	C-2	Lecture
Unit-I	Multiplexing	C-3	Lecture
Unit-I	Multiplexing	C-4	Lecture
Unit-I	Spread spectrum -MAC Protocols — SDMA- TDMA	C-5	Lecture
Unit-I	Spread spectrum -MAC Protocols — SDMA- TDMA	C-6	Lecture
Unit-I	Spread spectrum -MAC Protocols —FDMA- CDMA	C-7	Lecture
Unit-I	Spread spectrum -MAC Protocols — FDMA- CDMA	C-8	Lecture
Unit-I	Assignment 1	C-9	Classroom Assignment
Unit-II	Mobile telecommunication system		
Unit-II	Introduction to Cellular Systems	C-10	Lecture
Unit-II	Gsm — services & architecture protocols — connection establishment	C-11	Lecture
Unit-II	Frequency allocation — routing — mobility management	C-12	Lecture
Unit-II	Security — gprs- umts — architecture — handover — security	C-13	Lecture
Unit-II	Clarification of problems on Unit-II	C-14	Clarification Class
Unit-II	Presentation on various topics of Unit-II	C-15	Presentation
Unit-II	Assignment 2		Take Home Assignments
Unit-III	Mobile network layer		
Unit-III	Mobile IP — DHCP — adhoc– Proactive protocol-DSDV	C-16	Lecture
Unit-III	Mobile IP — DHCP — adhoc– Proactive protocol-DSDV	C-17	Lecture
Unit-III	Reactive routing protocols — dsr	C-18	Lecture
Unit-III	Reactive routing protocols — dsr	C-19	Lecture
Unit-III	AODV , Hybrid routing –ZRP, Multicast Routing-ODMRP	C-20	Lecture
Unit-III	AODV , Hybrid routing –ZRP, Multicast Routing-ODMRP	C-21	Lecture
Unit-III	Vehicular Ad Hoc networks (VANET) –MANET Vs VANET — Security	C-22	Lecture
Unit-III	Vehicular Ad Hoc networks (VANET) –MANET Vs VANET — Security	C-23	Lecture
Unit-III	Guest Lecture by……..	C-24	Guest Lecture
Unit-III	Clarification of problems on Unit-III	C-25	Clarification Class
Unit-III	Assignment-2	C-27	Classroom Assignment
Unit-III	Presentation on various topics of Unit-II & III	C-27	Presentation
Unit-IV	Mobile transport and application layer		
Unit-IV	Mobile tcp– wap — architecture — wdp	C-28	Lecture

Unit-IV	Wtls — wtp –wsp — wae — wta architecture — wml	C-29	Lecture
Unit-IV	Webinar on …….	C-30	Webinar
Unit-IV	Presentation on various topics of Unit-IV	C-31	Presentation
Unit-IV	Clarification of problems on Unit-IV	C-32	Clarification Class
UNIT-V	Mobile platforms and applications		
UNIT-V	Mobile device operating systems	C-33	Lecture
UNIT-V	Mobile device operating systems	C-34	Lecture
UNIT-V	Special constraints & requirements	C-35	Lecture
UNIT-V	Commercial mobile operating systems	C-36	Lecture
UNIT-V	Commercial mobile operating systems	C-37	Lecture
UNIT-V	Software Development Kit: ios, Android, blackberry, Windows Phone	C-38	Lecture
UNIT-V	Mcommerce — Structure — Pros & Cons	C-39	Lecture
UNIT-V	Mobile payment system — security issues	C-40	Lecture
UNIT-V	Seminar	C-41	Seminar
UNIT-V	Clarification of problems on Unit-IV	C-42	Clarification Class
UNIT-V	Presentation on various topics of Unit-V	C-43	Presentation
UNIT-V	Assignment-3	C-44	Classroom Assignment
UNIT-V	Assignment-4	C-45	Classroom Assignment

CSEE14027– Network Security & Cryptography

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Introduction to the concept of security		
Unit-I	Need of security, security approach	C-1	Lecture
Unit-I	Type of attack, substitution technique	C-2	Lecture
Unit-I	Transposition techniques	C-3	Lecture
Unit-I	Encryption and decryption	C-4	Lecture
Unit-I	Symmetric and asymmetric key cryptography	C-5	Lecture
Unit-I	Steganography	C-6	Lecture
Unit-I	Key range and key size	C-7	Lecture
Unit-I	Possible type of attack	C-8	Lecture
Unit-I	Clarification class1	C9	Clarification Class
	Home assignment-1		Home Assignments
	Class assignment-1	C-10	Class Assignment
Unit-II	Symmetric cryptography		
Unit-II	Algo type and mode, overview of symmetric key cryptography	C-11	Lecture
Unit-II	Des algorithm	C-12	Lecture
Unit-II	Idea algorithm	C-13	Lecture
Unit-II	Rc5	C-14	Lecture
Unit-II	Blowfish algorithm	C-15	Lecture
Unit-II	Aes algorithm	C-16	Lecture
	Clarification class 2	C-17	Clarification Class
	Home assignment-2		Home Assignments
Unit-III	Asymmetric key cryptography		
Unit-III	History of asymmetric key cryptography	C-18	Lecture
Unit-III	Seminar	C-19	Seminar
Unit-III	Overview of asymmetric key cryptography	C-20	Lecture
Unit-III	Rsa algorithm	C-21	Lecture
Unit-III	Digital signature	C-22	Lecture
Unit-III	Hmac algorithm	C-23	Lecture
Unit-III	Guest lecture	C-24	Guest lecture
Unit-III	Clarification class 3	C-25	Clarification Class
Unit-III	Mcq quiz based on job oriented	C-26	Quiz
	Home assignment-3		Home Assignments
Unit-IV	Key management & distribution		
Unit-IV	Kerberos	C-27	Lecture
Unit-IV	Ssl protocol	C-28	Lecture
Unit-IV	Webinar	C-29	Webinar
Unit-IV	Tls protocol	C-30	Lecture
Unit-IV	Http and https protocol	C-31	Lecture
Unit-IV	Ssh algorithm	C-32	Lecture
Unit-IV	Presentation	C-33	Presentation
Unit-IV	Presentation	C-34	Presentation
Unit-IV	Shttp protocol	C-35	Lecture

Unit-IV	Tsp protocol	C-36	Lecture

Unit-IV	Set protocol	C-37	Lecture
Unit-IV	Clarification class 4	C-38	Clarification Class
	Class room assignment 2	C-39	Class Assignment
	Class room assignment 3	C-40	Class Assignment
Unit-V	Information security		
Unit-V	Goals of protection, domain of protection, access matrix	C-41	Lecture
Unit-V	Security and authentication, revocation of access rights, program threats and system threads	C-42	Lecture
Unit-V	Clarification class 5	C-43	Clarification Class
	Guest lecture	C-44	Guest lecture
	Webinar	C-45	Webinar

CSEE14021– Soft Computing

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Introduction to Soft Computing	C-1	Lecture
Unit-I	Evolution of Soft Computing	C-2	Lecture
Unit-I	Characteristics of Soft Computing	C-3	Lecture
Unit-I	Components of Soft Computing: Fuzzy Logic, Neural Networks, Evolutionary Computing	C-4	Lecture
Unit-I	Applications of Soft Computing	C-5	Lecture
Unit-I	Introduction to Fuzzy Logic	C-6	Lecture
Unit-I	Fuzzy Sets and Operations	C-7	Lecture
Unit-I	Fuzzy Relations and Composition	C-8	Lecture
Unit-I	Clarification class 1	C-9	Clarification Class
Unit-I	Presentation 1	C-10	Presentation
Unit-I	Classroom assignment 1	C-11	Class Assignment
	Guest lecture	C-12	Guest lecture
Unit-II	Introduction to Fuzzy Logic	C-13	Lecture
Unit-II	Fuzzy Membership Functions	C-14	Lecture
Unit-II	Fuzzy Logic Operations	C-15	Lecture
Unit-II	Fuzzy Systems and Their Applications	C-16	Lecture
Unit-II	Fuzzy Inference Systems: Mamdani, Sugeno	C-17	Lecture
Unit-II	Defuzzification Techniques	C-18	Lecture
Unit-II	Fuzzy Clustering and Fuzzy Control	C-19	Lecture
Unit-II	Fuzzy Decision Making	C-20	Lecture
Unit-II	Applications of Fuzzy Logic in Control Systems	C-21	Lecture
Unit-II	Fuzzy Logic in Image Processing	C-22	Lecture
Unit-II	Fuzzy Systems in Real-world Applications	C-23	Lecture
Unit-II	Review of Fuzzy Logic	C-24	Lecture
Unit-II	Presentation 2	C-25	Presentation
Unit-II	Clarification class 2	C-26	Clarification Class
Unit-II	Classroom assignment 2	C-27	Class Assignment
	Webinar 1	C-28	Webinar
	Take home assignment 1		Home Assignments
Unit-III	Introduction to Neural Networks	C-29	Lecture
Unit-III	Perceptron and Multi-Layer Perceptron (MLP)	C-30	Lecture
Unit-III	Activation Functions in Neural Networks	C-31	Lecture
Unit-III	Backpropagation Algorithm	C-32	Lecture
Unit-III	Neural Network Architectures	C-33	Lecture
Unit-III	Training Neural Networks	C-34	Lecture
Unit-III	Radial Basis Function (RBF) Networks	C-35	Lecture
Unit-III	Convolutional Neural Networks (CNN)	C-36	Lecture
Unit-III	Recurrent Neural Networks (RNN)	C-37	Lecture
Unit-III	Applications of Neural Networks	C-38	Lecture
Unit-III	Hybrid Systems: Neural Networks and Fuzzy Logic	C-39	Lecture
Unit-III	Presentation 3	C-40	Presentation
	Clarification class 3	C-41	Clarification Class

	Classroom assignment 3	C-42	Class Assignment
	Workshop 1	C-43	Workshop
	Take home assignment 2		Home Assignments
	Quiz 1	C-44	Quiz
Unit-IV	Introduction to Evolutionary Algorithms		Lecture
Unit-IV	Genetic Algorithms (GA)	C-45	Lecture
Unit-IV	Operators in GA: Selection, Crossover, Mutation	C-46	Lecture
Unit-IV	GA for Optimization Problems	C-47	Lecture
Unit-IV	Presentation 4	C-48	Presentation
Unit-IV	Classroom assignment 4	C-49	Class Assignment
Unit-IV	Take home assignments 3		Home Assignments
Unit-IV	Swarm Intelligence: Particle Swarm Optimization (PSO) , Ant Colony Optimization (ACO)	C-50	Lecture
Unit-V	Introduction to Hybrid Soft Computing Systems, Fuzzy Neural Systems	C-51	Lecture
Unit-V	Evolutionary Fuzzy Systems, Applications of Hybrid Systems in Pattern Recognition	C-52	Lecture
Unit-V	Activity-2	C-53	Activity
Unit-V	Mutation operators for C and Java.	C-54	Lecture
Unit-V	Hybrid Systems in Control and Robotics, Hybrid Systems in Data Mining	C-55	Lecture
Unit-V	Hybrid Systems in Financial Forecasting, Soft Computing for Image Processing and Computer Vision	C-56	Lecture
Unit-V	Soft Computing in Healthcare Systems, Soft Computing in IoT and Smart Systems	C-57	Lecture
Unit-V	Clarification class 4	C-58	Clarification Class
Unit-V	Webinar 2	C-59	Webinar
Unit-V	Seminar	C-60	Seminar

CSEE14023– Parallel and Distributed Computing

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Introduction to Parallel and Distributed Computing	C-1	Lecture
Unit-I	Parallelism and Concurrency	C-2	Lecture
Unit-I	Evolution of Parallel and Distributed Systems	C-3	Lecture
Unit-I	Key Characteristics of Parallel and Distributed Systems	C-4	Lecture
Unit-I	Types of Parallelism: Data Parallelism, Task Parallelism	C-5	Lecture
Unit-I	Parallel Computing Models, Distributed Systems Models	C-6	Lecture
Unit-I	Components of Parallel and Distributed Systems, Applications of Parallel and Distributed Computing	C-7	Lecture
Unit-I	Challenges in Parallel and Distributed Computing, Future Trends in Parallel and Distributed Systems	C-8	Lecture
Unit-I	Clarification class 1	C-9	Clarification Class
Unit-I	Presentation 1	C-10	Presentation
Unit-I	Class room assignment 1	C-11	Class Assignment
	Guest lecture	C-12	Guest lecture
Unit-II	Introduction to Parallel Architectures, Shared Memory vs. Distributed Memory Architectures	C-13	Lecture
Unit-II	SIMD, MIMD, and SISD Architectures, Flynn's Taxonomy and its Applications	C-14	Lecture
Unit-II	Multiprocessor and Multicomputer Systems, Shared Memory Systems: Cache, Coherency, and Synchronization	C-15	Lecture
Unit-II	Distributed Memory Systems: Communication and Coordination, Message Passing Interface (MPI) Overview	C-16	Lecture
Unit-II	Hybrid Architectures in Parallel Computing, Performance Metrics for Parallel Systems	C-17	Lecture
Unit-II	Practical Considerations in Parallel Architectures	C-18	Lecture
Unit-III	Introduction to Distributed Systems	C-19	Lecture
Unit-III	Communication in Distributed Systems: Sockets, RPC	C-20	Lecture
Unit-III	Consistency and Replication in Distributed Systems	C-21	Lecture
Unit-III	Distributed Mutual Exclusion Algorithms, Distributed File Systems and Databases	C-22	Lecture
Unit-III	Distributed Shared Memory (DSM), Synchronization in Distributed Systems	C-23	Lecture
Unit-III	Fault Tolerance and Reliability in Distributed	C-24	Lecture

	Systems, Load Balancing in Distributed Systems		
Unit-III	Presentation 2	C-25	Presentation
Unit-III	Clarification class 2	C-26	Clarification Class
Unit-III	Classroom assignment 2	C-27	Class Assignment
	Webinar 1	C-28	Webinar
	Take home assignment 1		Home Assignments
Unit-III	Distributed Coordination and Consensus, Peer-to-Peer Systems	C-29	Lecture
Unit-IV	Introduction to Parallel Programming Models, Data Parallelism and Task Parallelism	C-30	Lecture
Unit-IV	Parallel Programming with OpenMP, CUDA Programming Model for GPUs	C-31	Lecture
Unit-IV	Shared Memory Programming with PThreads, Memory Models and Synchronization in Parallel Systems	C-32	Lecture
Unit-IV	Memory Models and Synchronization in Parallel Systems, Load Balancing and Task Scheduling	C-33	Lecture
Unit-IV	Parallel Algorithms for Searching and Sorting, Data Structures for Parallel Computing	C-34	Lecture
Unit-IV	Debugging and Performance Tuning in Parallel Programs	C-35	Lecture
Unit-V	Grid Computing Overview	C-36	Lecture
Unit-V	Cloud Computing and its Relation to Parallel Computing	C-37	Lecture
Unit-V	High-Performance Computing (HPC)	C-38	Lecture
Unit-V	Virtualization in Distributed Systems	C-39	Lecture
Unit-V	Presentation 3	C-40	Presentation
	Clarification class 3	C-41	Clarification Class
	Classroom assignment 3	C-42	Class Assignment
	Workshop 1	C-43	Workshop
	Take home assignment 2		Home Assignments
	Quiz 1	C-44	Quiz
Unit-V	Quantum Computing and Parallelism		Lecture
Unit-V	MapReduce Programming Model	C-45	Lecture
Unit-V	Parallelization of Numerical Methods	C-46	Lecture
Unit-V	Security and Privacy in Distributed Systems	C-47	Lecture
Unit-V	Presentation 4	C-48	Presentation
Unit-V	Class room assignment 4	C-49	Class Assignment
Unit-V	Take home assignments 3		Home Assignments
Unit-V	Scalability and Performance Analysis of Parallel Systems	C-50	Lecture
Unit-V	Energy-Efficient Parallel and Distributed Computing	C-51	Lecture
Unit-V	Autonomous Systems and Parallel Computing	C-52	Lecture
Unit-V	Activity-2	C-53	Activity
Unit-V	Future Trends in Parallel and Distributed	C-54	Lecture

	Computing		
Unit-V	Final Project Work: Developing Parallel and Distributed Applications	C-55	Lecture
Unit-V	Final Project Presentations	C-56	Lecture
Unit-V	Exam Review and Course Summary	C-57	Lecture
Unit-V	Clarification class 4	C-58	Clarification Class
	Webinar 2	C-59	Webinar
	Seminar	C-60	Seminar

CSEE14024-Grid Computing

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Introduction to Grid Computing	C-1	Lecture
Unit-I	Definition and Characteristics of Grid Computing	C-2	Lecture
Unit-I	Evolution of Grid Computing	C-3	Lecture
Unit-I	Applications of Grid Computing	C-4	Lecture
Unit-I	Grid vs. Cloud Computing	C-5	Lecture
Unit-I	Grid Computing Architecture	C-6	Lecture
Unit-I	Types of Grid Computing: Computational, Data, and Service Grids	C-7	Lecture
Unit-I	Role of Middleware in Grid Computing, Grid Computing in Scientific Research and Industry	C-8	Lecture
Unit-I	Clarification class 1	C-9	Clarification Class
Unit-I	Presentation 1	C-10	Presentation
Unit-I	Class room assignment 1	C-11	Class Assignment
	Guest lecture	C-12	Guest lecture
Unit-II	Overview of Grid Architecture, Grid Resource Management and Scheduling	C-13	Lecture
Unit-II	Grid Middleware: Overview and Types, Grid Security and Authentication	C-14	Lecture
Unit-II	Globus Toolkit for Grid Computing, Job Submission and Execution in a Grid	C-15	Lecture
Unit-II	Grid Resource Discovery and Management, Data Management in Grid Computing	C-16	Lecture
Unit-II	Grid Monitoring and Performance Evaluation	C-17	Lecture
Unit-II	Fault Tolerance and Reliability in Grid Systems	C-18	Lecture
Unit-II	Scheduling Algorithms in Grid Computing	C-19	Lecture
Unit-II	Practical Use of Grid Middleware	C-20	Lecture
Unit-II	Disaster Management and Emergency Response Systems	C-21	Lecture
Unit-II	Applications in Bioinformatics	C-22	Lecture
Unit-II	Environmental and Weather Forecasting Applications	C-23	Lecture
Unit-II	Applications of Grid Computing in Simulation	C-24	Lecture
Unit-II	Presentation 2	C-25	Presentation
Unit-II	Clarification class 2	C-26	Clarification Class
Unit-II	Classroom assignment 2	C-27	Class Assignment
	Webinar 1	C-28	Webinar
	Take home assignment 1		Home Assignments
Unit-III	Commercial Applications of Grid Computing	C-29	Lecture
Unit-III	Future Trends and Opportunities in Grid Computing	C-30	Lecture
Unit-III	Collaborative Research Projects Using Grid	C-31	Lecture
Unit-III	Scientific Computing Applications in Grid	C-32	Lecture
Unit-IV	Introduction to Grid Computing Technologies	C-33	Lecture
Unit-IV	Grid Data Management Tools	C-34	Lecture

Unit-IV	Grid Programming Models: Message Passing, Remote Procedure Calls (RPC)	C-35	Lecture
Unit-IV	Distributed File Systems in Grid	C-36	Lecture
Unit-IV	Grid Applications Programming Interface (GAPI)	C-37	Lecture
Unit-IV	High-Performance Computing in Grid Systems, Virtualization in Grid Computing	C-38	Lecture
Unit-IV	Using Hadoop in Grid Environments	C-39	Lecture
Unit-IV	Presentation 3	C-40	Presentation
	Clarification class 3	C-41	Clarification Class
	Classroom assignment 3	C-42	Class Assignment
	Workshop 1	C-43	Workshop
	Take home assignment 2		Home Assignments
	Quiz 1	C-44	Quiz
Unit-V	Security Challenges in Grid Computing		Lecture
Unit-V	Cryptography and Authentication in Grid Systems	C-45	Lecture
Unit-V	Access Control Models for Grid Systems	C-46	Lecture
Unit-V	Privacy Issues in Grid Computing	C-47	Lecture
Unit-V	Presentation 4	C-48	Presentation
Unit-V	Class room assignment 4	C-49	Class Assignment
Unit-V	Take home assignments 3		Home Assignments
Unit-V	Resource Scheduling and Load Balancing in Grids	C-50	Lecture
Unit-V	Grid Security Policies and Frameworks	C-51	Lecture
Unit-V	Fault Tolerance and Recovery in Grid Systems	C-52	Lecture
Unit-V	Activity-2	C-53	Activity
Unit-V	Mutation operators for C and Java.	C-54	Lecture
Unit-V	Grid Computing and the Internet of Things (IoT)	C-55	Lecture
Unit-V	Grid Computing in Smart Cities and Smart Grids	C-56	Lecture
Unit-V	Future of Grid Computing	C-57	Lecture
Unit-V	Clarification class 4	C-58	Clarification Class
	Webinar 2	C-59	Webinar
	Seminar	C-60	Seminar

CSEE14025- Ubiquitous and Pervasive Computing

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Definition and Scope of Ubiquitous Computing	C-1	Lecture
Unit-I	Evolution of Ubiquitous and Pervasive Computing	C-2	Lecture
Unit-I	Key Technologies in Pervasive Computing	C-3	Lecture
Unit-I	Ubiquitous Computing and Its Impact on Society	C-4	Lecture
Unit-I	Requirements of Ubiquitous Computing Systems	C-5	Lecture
Unit-I	Pervasive Computing vs. Mobile Computing	C-6	Lecture
Unit-I	Architecture of Pervasive Computing Systems	C-7	Lecture
Unit-I	Middleware and its Role in Pervasive Computing	C-8	Lecture
Unit-I	Clarification class 1	C-9	Clarification Class
Unit-I	Presentation 1	C-10	Presentation
Unit-I	Class room assignment 1	C-11	Class Assignment
	Guest lecture	C-12	Guest lecture
Unit-II	IEEE 802.11 (Wi-Fi) and IEEE 802.15 (Bluetooth) Standards	C-13	Lecture
Unit-II	Sensor Networks and Communication Protocols	C-14	Lecture
Unit-II	Ad-Hoc Networks and Mobile Networks	C-15	Lecture
Unit-II	IoT Communication Protocols: MQTT, CoAP	C-16	Lecture
Unit-II	Low Power Wide Area Networks (LPWAN)	C-17	Lecture
Unit-II	Interoperability in Pervasive Systems	C-18	Lecture
Unit-II	Data Communication and Security in Pervasive Computing	C-19	Lecture
Unit-II	Cloud Computing and Its Role in Ubiquitous Systems	C-20	Lecture
Unit-II	Data Storage in Pervasive Systems	C-21	Lecture
Unit-II	Real-Time Communication and Challenges	C-22	Lecture
Unit-II	Network Protocols for Pervasive Computing	C-23	Lecture
Unit-II	Network Protocols for Pervasive Computing	C-24	Lecture
Unit-II	Presentation 2	C-25	Presentation
Unit-II	Clarification class 2	C-26	Clarification Class
Unit-II	Classroom assignment 2	C-27	Class Assignment
	Webinar 1	C-28	Webinar
	Take home assignment 1		Home Assignments
Unit-III	Introduction to Context-Aware Computing	C-29	Lecture
Unit-III	Context Models and Their Importance	C-30	Lecture
Unit-III	Context Sensing and Data Collection Techniques	C-31	Lecture
Unit-III	Types of Context: Physical, Social, and Environmental	C-32	Lecture

Unit-III	Sensor Networks for Context-Aware Systems	C-33	Lecture
Unit-III	Context-Aware Applications	C-34	Lecture
Unit-III	Sensor Fusion for Context Detection	C-35	Lecture
Unit-IV	Distributed Systems in Pervasive Computing	C-36	Lecture
Unit-IV	Mobile Computing and Its Challenges	C-37	Lecture
Unit-IV	Mobile Middleware and its Role	C-38	Lecture
Unit-IV	Mobile Operating Systems and Their Relevance	C-39	Lecture
Unit-IV	Presentation	C-40	Presentation
	Clarification class	C-41	Clarification Class
	Classroom assignment	C-42	Class Assignment
	Workshop 1	C-43	Workshop
	Take home assignment		Home Assignments
	Quiz 1	C-44	Quiz
Unit-IV	Mobile Cloud Computing		Lecture
Unit-IV	Distributed Computing Models	C-45	Lecture
Unit-IV	Data Synchronization in Distributed Systems	C-46	Lecture
Unit-V	Mobile Computing Frameworks	C-47	Lecture
Unit-V	Presentation	C-48	Presentation
Unit-V	Class room assignment	C-49	Class Assignment
Unit-V	Take home assignments		Home Assignments
Unit-V	Privacy Concerns in Ubiquitous Systems	C-50	Lecture
Unit-V	Data Protection and Encryption in Ubiquitous Computing	C-51	Lecture
Unit-V	User Authentication in Pervasive Computing Systems	C-52	Lecture
Unit-V	Activity	C-53	Activity
Unit-V	Mutation operators for C and Java.	C-54	Lecture
Unit-V	Secure Communication Protocols, Ethical Implications of Pervasive and Ubiquitous Computing	C-55	Lecture
Unit-V	Legal Aspects of Ubiquitous Computing, Trust Models in Pervasive Systems	C-56	Lecture
Unit-V	Social and Cultural Impact of Ubiquitous Computing, Evaluating Security Mechanisms in Ubiquitous Systems	C-57	Lecture
Unit-V	Clarification class 4	C-58	Clarification Class
	Webinar 2	C-59	Webinar
	Seminar	C-60	Seminar

CSEE14026- Natural Language Processing

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Overview of Language Processing Tasks	C-1	Lecture
Unit-I	Language Models: Unigrams, Bigrams	C-2	Lecture
Unit-I	Types of NLP: Statistical, Rule-based, Hybrid, Challenges in NLP	C-3	Lecture
Unit-I	Text Preprocessing: Tokenization, Stemming, Lemmatization, Text Normalization: Lowercasing, Stopwords Removal	C-4	Lecture
Unit-I	Part-of-Speech (POS) Tagging	C-5	Lecture
Unit-I	Named Entity Recognition (NER)	C-6	Lecture
Unit-I	Introduction to NLP Libraries: NLTK, spaCy	C-7	Lecture
Unit-I	Regular Expressions for Text Processing	C-8	Lecture
Unit-I	Clarification class 1	C-9	Clarification Class
Unit-I	Presentation 1	C-10	Presentation
Unit-I	Class room assignment 1	C-11	Class Assignment
	Guest lecture	C-12	Guest lecture
Unit-II	Syntax and its Role in NLP, Phrase Structure Grammar	C-13	Lecture
Unit-II	Dependency Grammar, Context-Free Grammar (CFG)	C-14	Lecture
Unit-II	Top-down and Bottom-up Parsing, LL, LR Parsing Techniques	C-15	Lecture
Unit-II	Earley Parser and its Application, Shift-Reduce Parsing Techniques, Syntactic Parsing Algorithms	C-16	Lecture
Unit-II	Evaluating Parsing Performance	C-17	Lecture
Unit-II	Introduction to Parsing in NLP Tools	C-18	Lecture
Unit-II	Building a Simple Parser in Python	C-19	Lecture
Unit-III	Introduction to Semantics in NLP	C-20	Lecture
Unit-III	Word Sense Disambiguation (WSD)	C-21	Lecture
Unit-III	Semantic Role Labeling (SRL)	C-22	Lecture
Unit-III	Named Entity Recognition (NER) Revisited	C-23	Lecture
Unit-III	Sentiment Analysis and Opinion Mining	C-24	Lecture
Unit-III	Presentation 2	C-25	Presentation
Unit-III	Clarification class 2	C-26	Clarification Class
Unit-III	Classroom assignment 2	C-27	Class Assignment
	Webinar 1	C-28	Webinar
	Take home assignment 1		Home Assignments
Unit-III	Feature Extraction for Sentiment Analysis	C-29	Lecture
Unit-III	Word Embeddings: Word2Vec, GloVe	C-30	Lecture
Unit-III	Contextual Word Embeddings: BERT, ELMo	C-31	Lecture
Unit-III	Relationship between Words: Co-occurrence and Word Similarity	C-32	Lecture
Unit-III	Applications of Word Embeddings	C-33	Lecture
Unit-III	Evaluation Metrics for Semantic Analysis	C-34	Lecture
Unit-IV	Introduction to Machine Learning for NLP	C-35	Lecture

Unit-IV	Supervised Learning for NLP Tasks	C-36	Lecture
Unit-IV	Text Classification Algorithms: Naive Bayes, SVM	C-37	Lecture
Unit-IV	Unsupervised Learning for NLP: Clustering	C-38	Lecture
Unit-IV	K-means and DBSCAN Clustering for Text	C-39	Lecture
Unit-IV	Presentation 3	C-40	Presentation
	Clarification class 3	C-41	Clarification Class
	Classroom assignment 3	C-42	Class Assignment
	Workshop 1	C-43	Workshop
	Take home assignment 2		Home Assignments
	Quiz 1	C-44	Quiz
Unit-IV	Deep Learning in NLP: An Overview		Lecture
Unit-IV	Recurrent Neural Networks (RNN) for NLP	C-45	Lecture
Unit-IV	Long Short-Term Memory (LSTM) Networks	C-46	Lecture
Unit-IV	Transformers and Attention Mechanisms	C-47	Lecture
Unit-IV	Presentation 4	C-48	Presentation
Unit-IV	Class room assignment 4	C-49	Class Assignment
Unit-IV	Take home assignments 3		Home Assignments
Unit-V	Machine Translation (MT)	C-50	Lecture
Unit-V	Rule-based and Statistical MT	C-51	Lecture
Unit-V	Neural Machine Translation (NMT)	C-52	Lecture
Unit-V	Activity-2	C-53	Activity
Unit-V	Mutation operators for C and Java.	C-54	Lecture
Unit-V	Speech Recognition and NLP	C-55	Lecture
Unit-V	Question Answering Systems, Chatbots and Virtual Assistants	C-56	Lecture
Unit-V	Text Summarization: Extractive vs. Abstractive, Text Generation and Language Models	C-57	Lecture
Unit-V	Clarification class 4	C-58	Clarification Class
	Webinar 2	C-59	Webinar
	Seminar	C-60	Seminar

CSEE14028- Image Processing

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Introduction to Image Processing	C-1	Lecture
Unit-I	Components of Image Processing Systems	C-2	Lecture
Unit-I	Types of Images: Binary, Grayscale, Color	C-3	Lecture
Unit-I	Image Representation: Matrix and Pixel Concepts	C-4	Lecture
Unit-I	Image Acquisition and Formats	C-5	Lecture
Unit-I	Basic Operations on Images: Scaling, Rotation	C-6	Lecture
Unit-I	Image Sampling and Quantization	C-7	Lecture
Unit-I	Image Storage Formats and Compression	C-8	Lecture
Unit-I	Clarification class 1	C-9	Clarification Class
Unit-I	Presentation 1	C-10	Presentation
Unit-I	Class room assignment 1	C-11	Class Assignment
	Guest lecture	C-12	Guest lecture
Unit-II	Point Operations and Intensity Transformation	C-13	Lecture
Unit-II	Histogram Equalization	C-14	Lecture
Unit-II	Image Negative and Logarithmic Transformations	C-15	Lecture
Unit-II	Spatial Domain Filtering	C-16	Lecture
Unit-II	Smoothing Filters: Mean, Median	C-17	Lecture
Unit-II	Sharpening Filters: High-Pass Filtering	C-18	Lecture
Unit-II	Image Filtering in Frequency Domain	C-19	Lecture
Unit-II	Fourier Transform and its Application	C-20	Lecture
Unit-II	Image Enhancement Using Filters	C-21	Lecture
Unit-II	Color Image Enhancement Techniques	C-22	Lecture
Unit-II	Noise Removal and Image Restoration	C-23	Lecture
Unit-II	Edge Detection Techniques: Sobel, Prewitt	C-24	Lecture
Unit-II	Presentation 2	C-25	Presentation
Unit-II	Clarification class 2	C-26	Clarification Class
Unit-II	Classroom assignment 2	C-27	Class Assignment
	Webinar 1	C-28	Webinar
	Take home assignment 1		Home Assignments
Unit-III	Image Segmentation: Concepts and Applications	C-29	Lecture
Unit-III	Thresholding Techniques	C-30	Lecture
Unit-III	Region-Based Segmentation	C-31	Lecture
Unit-III	Edge-Based Segmentation	C-32	Lecture
Unit-III	Watershed Algorithm for Image Segmentation	C-33	Lecture
Unit-III	Connected Components Labeling	C-34	Lecture
Unit-III	Object Representation in Image Processing	C-35	Lecture
Unit-III	Boundary and Region Representation	C-36	Lecture
Unit-III	Image Contour Detection	C-37	Lecture
Unit-III	Morphological Operations on Images	C-38	Lecture
Unit-III	Skeletonization and Thinning Algorithms	C-39	Lecture
Unit-III	Presentation 3	C-40	Presentation

	Clarification class 3	C-41	Clarification Class
	Classroom assignment 3	C-42	Class Assignment
	Workshop 1	C-43	Workshop
	Take home assignment 2		Home Assignments
	Quiz 1	C-44	Quiz
Unit-IV	Geometric Transformations in Image Processing		Lecture
Unit-IV	Affine and Perspective Transformations	C-45	Lecture
Unit-IV	Image Scaling and Rotation Techniques	C-46	Lecture
Unit-IV	Image Warping and Resampling	C-47	Lecture
Unit-IV	Presentation 4	C-48	Presentation
Unit-IV	Class room assignment 4	C-49	Class Assignment
Unit-IV	Take home assignments 3		Home Assignments
Unit-IV	Feature Extraction and Object Recognition	C-50	Lecture
Unit-IV	Texture and Pattern Recognition	C-51	Lecture
Unit-V	Object Detection and Recognition, Image Classification Techniques, Machine Learning in Image Processing, Deep Learning for Image Processing	C-52	Lecture
Unit-V	Activity-2	C-53	Activity
Unit-V	Mutation operators for C and Java.	C-54	Lecture
Unit-V	Convolutional Neural Networks (CNN), Image Compression and Storage for Applications	C-55	Lecture
Unit-V	Video Processing and Analysis, 3D Image Processing and Reconstruction	C-56	Lecture
Unit-V	Medical Imaging and Applications, Satellite Imaging and Remote Sensing, Robotics and Image Processing	C-57	Lecture
Unit-V	Clarification class 4	C-58	Clarification Class
	Webinar 2	C-59	Webinar
	Seminar	C-60	Seminar

CSEE14029- Multimedia Technologies

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Multimedia Systems and Components	C-1	Lecture
Unit-I	Types of Media: Text, Audio, Images, Video	C-2	Lecture
Unit-I	Media Storage and Retrieval	C-3	Lecture
Unit-I	Representation of Text, Image, Audio, and Video	C-4	Lecture
Unit-I	Multimedia Communication Systems	C-5	Lecture
Unit-I	File Formats and Standards for Multimedia	C-6	Lecture
Unit-I	Multimedia Operating Systems and Tools	C-7	Lecture
Unit-I	Compression Techniques for Multimedia, Digital Imaging: Basics and Techniques	C-8	Lecture
Unit-I	Clarification class 1	C-9	Clarification Class
Unit-I	Presentation 1	C-10	Presentation
Unit-I	Class room assignment 1	C-11	Class Assignment
	Guest lecture	C-12	Guest lecture
Unit-II	Basics of Image Compression, Lossless and Lossy Compression Techniques	C-13	Lecture
Unit-II	JPEG Compression and Formats, Advanced Image Compression Techniques	C-14	Lecture
Unit-II	Basics of Audio Compression, MP3 Compression and File Formats	C-15	Lecture
Unit-II	Advanced Audio Compression: AAC, OGG, Video Compression Techniques	C-16	Lecture
Unit-II	MPEG Standards and Their Applications, H.264 and HEVC Compression Techniques	C-17	Lecture
Unit-II	Multimedia Systems: Overview and Architecture, Multimedia Processing Units	C-18	Lecture
Unit-II	Memory and Storage Management for Multimedia, Real-Time Processing for Multimedia	C-19	Lecture
Unit-II	Operating Systems for Multimedia, Multimedia Application Development	C-20	Lecture
Unit-II	Software Tools for Multimedia Applications, Digital Signal Processing (DSP) for Multimedia	C-21	Lecture
Unit-II	Multimedia Streaming and Delivery, Multimedia Content Distribution	C-22	Lecture
Unit-II	Development Life Cycle of Multimedia Systems, Multimedia Software Architecture	C-23	Lecture
Unit-II	Interactive Multimedia Applications, GUI Design for Multimedia Applications	C-24	Lecture
Unit-II	Presentation 2	C-25	Presentation
Unit-II	Clarification class 2	C-26	Clarification Class
Unit-II	Classroom assignment 2	C-27	Class Assignment
	Webinar 1	C-28	Webinar
	Take home assignment 1		Home Assignments

Unit-III	Audio-Visual Synchronization, Human-Computer Interaction in Multimedia	C-29	Lecture
Unit-III	Building Multimedia Databases, Real-Time Multimedia Systems Design	C-30	Lecture
Unit-III	Multimedia Information Retrieval	C-31	Lecture
Unit-III	Introduction to Multimedia Applications	C-32	Lecture
Unit-III	Multimedia in Entertainment and Gaming	C-33	Lecture
Unit-III	Multimedia in Education and E-Learning	C-34	Lecture
Unit-III	Multimedia in Virtual and Augmented Reality	C-35	Lecture
Unit-IV	Multimedia in Advertising and Marketing	C-36	Lecture
Unit-IV	Multimedia in Healthcare	C-37	Lecture
Unit-IV	Multimedia in Scientific Visualization	C-38	Lecture
Unit-IV	Multimedia in Digital Libraries	C-39	Lecture
Unit-IV	Presentation 3	C-40	Presentation
	Clarification class 3	C-41	Clarification Class
	Classroom assignment 3	C-42	Class Assignment
	Workshop 1	C-43	Workshop
	Take home assignment 2		Home Assignments
	Quiz 1	C-44	Quiz
Unit-V	Mobile Multimedia Applications		Lecture
Unit-V	Future Trends in Multimedia Technologies	C-45	Lecture
Unit-V	Future Trends in Multimedia Technologies	C-46	Lecture
Unit-V	Ethical Issues in Multimedia Technology	C-47	Lecture
Unit-V	Presentation 4	C-48	Presentation
Unit-V	Classroom assignment 4	C-49	Class Assignment
Unit-V	Take home assignments 3		Home Assignments
Unit-V	Ethical Issues in Multimedia Technology	C-50	Lecture
Unit-V	Review and Evaluation of Multimedia Systems	C-51	Lecture
Unit-V	Design a Multimedia Application	C-52	Lecture
Unit-V	Activity-2	C-53	Activity
Unit-V	Mutation operators for C and Java.	C-54	Lecture
Unit-V	Design a Multimedia Application	C-55	Lecture
Unit-V	Design a Multimedia Application	C-56	Lecture
Unit-V	Design a Multimedia Application	C-57	Lecture
Unit-V	Clarification class 4	C-58	Clarification Class
	Webinar 2	C-59	Webinar
	Seminar	C-60	Seminar

CSEE14030- System Programming

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Role of System Software in Computer Systems	C-1	Lecture
Unit-I	Relationship Between System Software and Application Software	C-2	Lecture
Unit-I	Relationship Between System Software and Application Software	C-3	Lecture
Unit-I	Components of System Software	C-4	Lecture
Unit-I	Components of System Software	C-5	Lecture
Unit-I	Operating Systems: Overview and Functions	C-6	Lecture
Unit-I	Memory Management and Process Scheduling	C-7	Lecture
Unit-I	I/O Systems and File Systems	C-8	Lecture
Unit-I	Clarification class 1	C-9	Clarification Class
Unit-I	Presentation 1	C-10	Presentation
Unit-I	Class room assignment 1	C-11	Class Assignment
	Guest lecture	C-12	Guest lecture
Unit-I	Machine-Level Representation of Programs	C-13	Lecture
Unit-I	System Calls and Interrupt Handling	C-14	Lecture
Unit-II	Introduction to Assemblers	C-15	Lecture
Unit-II	Assembly Language Syntax and Structure	C-16	Lecture
Unit-II	Passes in an Assembler	C-17	Lecture
Unit-II	Design of a Simple Assembler	C-18	Lecture
Unit-II	Working of a Linker	C-19	Lecture
Unit-II	Relocation and Linking Concepts	C-20	Lecture
Unit-II	Static vs. Dynamic Linking	C-21	Lecture
Unit-II	Linking for Different Data Types	C-22	Lecture
Unit-II	Linker and Loader: Techniques and Applications	C-23	Lecture
Unit-II		C-24	Lecture
Unit-II	Presentation 2	C-25	Presentation
Unit-II	Clarification class 2	C-26	Clarification Class
Unit-II	Classroom assignment 2	C-27	Class Assignment
	Webinar 1	C-28	Webinar
	Take home assignment 1		Home Assignments
Unit-III	Macro Definition and Expansion	C-29	Lecture
Unit-III	Types of Macros: Function and Object-like	C-30	Lecture
Unit-III	Macro Substitution Techniques	C-31	Lecture
Unit-III	Conditional Compilation and Include Guards	C-32	Lecture
Unit-III	Introduction to Preprocessors, Preprocessor Directives and Control Flow	C-33	Lecture
Unit-III	File Inclusion Mechanism	C-34	Lecture
Unit-III	Recursive Macros and Preprocessor Directives	C-35	Lecture
Unit-IV	System Calls and Services	C-36	Lecture
Unit-IV	Process Management and Scheduling in OS	C-37	Lecture
Unit-IV	Memory Management Services in OS	C-38	Lecture

Unit-IV	I/O Services and File Handling in OS	C-39	Lecture
Unit-IV	Presentation 3	C-40	Presentation
	Clarification class 3	C-41	Clarification Class
	Classroom assignment 3	C-42	Class Assignment
	Workshop 1	C-43	Workshop
	Take home assignment 2		Home Assignments
	Quiz 1	C-44	Quiz
Unit-IV	File System Organization		Lecture
Unit-IV	Device Drivers and Kernel Programming	C-45	Lecture
Unit-IV	System Utilities: Shell and System Programs	C-46	Lecture
Unit-IV	System Utilities: Shell and System Programs	C-47	Lecture
Unit-IV	Presentation 4	C-48	Presentation
Unit-IV	Class room assignment 4	C-49	Class Assignment
Unit-IV	Take home assignments 3		Home Assignments
Unit-V	System Utilities for File and Memory Management	C-50	Lecture
Unit-V	Debugging and Profiling Tools in OS	C-51	Lecture
Unit-V	Overview of System Software Development	C-52	Lecture
Unit-V	Activity-2	C-53	Activity
Unit-V	Mutation operators for C and Java.	C-54	Lecture
Unit-V	System Software Development Lifecycle	C-55	Lecture
Unit-V	Debugging and Optimization in System Programming	C-56	Lecture
Unit-V	Profiling System Software	C-57	Lecture
Unit-V	Clarification class 4	C-58	Clarification Class
	Webinar 2	C-59	Webinar
	Seminar	C-60	Seminar

CSEE14031- Heterogeneous Computing with OpenCL

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Introduction to Heterogeneous Computing	C-1	Lecture
Unit-I	Importance of Heterogeneous Computing in Modern Systems	C-2	Lecture
Unit-I	Overview of OpenCL and its Architecture	C-3	Lecture
Unit-I	Platform and Device Models in OpenCL	C-4	Lecture
Unit-I	Host and Device Memory Models in OpenCL	C-5	Lecture
Unit-I	OpenCL Runtime and Execution Model	C-6	Lecture
Unit-I	OpenCL Components: Context, Queue, Program	C-7	Lecture
Unit-I	Installation and Setup of OpenCL	C-8	Lecture
Unit-I	Clarification class 1	C-9	Clarification Class
Unit-I	Presentation 1	C-10	Presentation
Unit-I	Class room assignment 1	C-11	Class Assignment
	Guest lecture	C-12	Guest lecture
Unit-II	Overview of OpenCL Programming Model	C-13	Lecture
Unit-II	Structure of an OpenCL Program	C-14	Lecture
Unit-II	Buffers and Memory Allocation in OpenCL	C-15	Lecture
Unit-II	Command Queues and Execution Models	C-16	Lecture
Unit-II	Kernel Execution: Work-Groups and Work-Items	C-17	Lecture
Unit-II	Synchronization in OpenCL	C-18	Lecture
Unit-II	Data Transfer Between Host and Device	C-19	Lecture
Unit-II	Managing Multiple Devices in OpenCL	C-20	Lecture
Unit-II	OpenCL Event Handling and Profiling	C-21	Lecture
Unit-II	Optimization Techniques for OpenCL Kernels	C-22	Lecture
Unit-II	Memory Hierarchy in OpenCL: Global, Local, and Private Memory	C-23	Lecture
Unit-II	Error Handling and Debugging in OpenCL	C-24	Lecture
Unit-II	Presentation 2	C-25	Presentation
Unit-II	Clarification class 2	C-26	Clarification Class
Unit-II	Classroom assignment 2	C-27	Class Assignment
	Webinar 1	C-28	Webinar
	Take home assignment 1		Home Assignments
Unit-III	Introduction to Parallel Programming in OpenCL	C-29	Lecture
Unit-III	Parallel Loops and Reduction Operations	C-30	Lecture
Unit-III	Work-Item and Work-Group Sizing Strategies	C-31	Lecture
Unit-III	OpenCL Parallel Algorithms: Vector Addition	C-32	Lecture
Unit-III	Matrix Multiplication in Parallel	C-33	Lecture
Unit-III	Parallel Prefix Sum (Scan) Algorithm	C-34	Lecture
Unit-III	OpenCL and SIMD Architecture	C-35	Lecture
Unit-III	Understanding OpenCL's Compute Units	C-36	Lecture
Unit-III	Optimizing Parallel Programs in OpenCL	C-37	Lecture
Unit-IV	Introduction to GPU Programming with OpenCL	C-38	Lecture

Unit-IV	Advanced OpenCL Optimizations, Reducing Divergence in OpenCL Kernels	C-39	Lecture
Unit-IV	Presentation 3	C-40	Presentation
Unit-IV	Clarification class 3	C-41	Clarification Class
Unit-IV	Classroom assignment 3	C-42	Class Assignment
	Workshop 1	C-43	Workshop
	Take home assignment 2		Home Assignments
	Quiz 1	C-44	Quiz
Unit-IV	Performance Tuning and Profiling in OpenCL, OpenCL Shared Memory Optimization Techniques		Lecture
Unit-IV	Utilizing OpenCL for Multi-GPU Systems, Hybrid CPU and GPU Programming	C-45	Lecture
Unit-IV	Real-Time OpenCL Applications: Case Studies. Memory Coalescing and Optimizing Data Transfers	C-46	Lecture
Unit-IV	OpenCL for Image Processing Applications	C-47	Lecture
Unit-IV	Presentation 4	C-48	Presentation
Unit-IV	Class room assignment 4	C-49	Class Assignment
Unit-IV	Take home assignments 3		Home Assignments
Unit-V	Introduction to Real-Time Heterogeneous Applications	C-50	Lecture
Unit-V	OpenCL in Machine Learning Applications, OpenCL in Computational Fluid Dynamics (CFD)	C-51	Lecture
Unit-V	OpenCL for Cryptography and Security	C-52	Lecture
Unit-V	Activity-2	C-53	Activity
Unit-V	Mutation operators for C and Java.	C-54	Lecture
Unit-V	OpenCL in Video and Image Processing	C-55	Lecture
Unit-V	Real-World Projects using OpenCL	C-56	Lecture
Unit-V	OpenCL in Data Science and Big Data, OpenCL in Financial Modeling	C-57	Lecture
Unit-V	Clarification class 4	C-58	Clarification Class
	Webinar 2	C-59	Webinar
	Seminar	C-60	Seminar

CSEE14038- Data Mining Techniques and Applications

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Data Warehousing		
Unit-I	Data Warehousing: Introduction, What is Data Warehouse? Definition	C-1	Lecture
Unit-I	Multidimensional Data Model, OLAP Operations, Warehouse Schema	C-2	Lecture
Unit-I	Data Warehouse Architecture, Warehouse Server, Metadata, OLAP Engine, Data Warehouse Backend Process	C-3	Lecture
Unit-I	Other Features Data Preprocessing, Descriptive Data Summarization	C-4	Lecture
Unit-I	Data Cleaning, Data Integration and Transformation	C-5	Lecture
Unit-I	Data Cleaning, Data Integration and Transformation	C-6	Lecture
Unit-I	Data Reduction	C-7	Lecture
Unit-I	Data Discretization and Concept Hierarchy Generation	C-8	Lecture
Unit-I	Assignment	C-9	Classroom Assignment
Unit-II	Data Mining:		
Unit-II	Data Mining: What is Data Mining? Data Mining: Definitions	C-10	Lecture
Unit-II	KDD vs Data Mining, DBMS vs DM	C-11	Lecture
Unit-II	Other Related Areas, DM Techniques	C-12	Lecture
Unit-II	Other Mining Techniques, Issues and Challenges in DM, DM Applications- Case Studies	C-13	Lecture
Unit-II	Clarification	C-14	Clarification Class
Unit-II	Presentation	C-15	Presentation
Unit-II	Assignment		Take Home Assignments
Unit-III	Clustering Techniques		
Unit-III	Clustering Techniques: Clustering Paradigms	C-16	Lecture
Unit-III	Clustering Techniques: Clustering Paradigms	C-17	Lecture
Unit-III	Clustering Techniques: Clustering Paradigms	C-18	Lecture
Unit-III	Partitioning Algorithms, k-Medoid Algorithms, CLARA	C-19	Lecture
Unit-III	Partitioning Algorithms, k-Medoid Algorithms, CLARA	C-20	Lecture
Unit-III	Partitioning Algorithms, k-Medoid Algorithms, CLARA	C-21	Lecture
Unit-III	Partitioning Algorithms, k-Medoid Algorithms, CLARA	C-22	Lecture
Unit-III	CLARANS, Hierarchical Clustering, DBSCAN, BIRCH	C-23	Lecture
Unit-III	Guest Lecture by……..	C-24	Guest Lecture
Unit-III	Clarification	C-25	Clarification Class
Unit-III	Assignment	C-27	Classroom

			Assignment
Unit-III	Presentation	C-27	Presentation
Unit-III	CURE, Categorical Clustering Algorithms, STIRR, ROCK, CACTUS	C-28	Lecture
Unit-III	CURE, Categorical Clustering Algorithms, STIRR, ROCK, CACTUS	C-29	Lecture
Unit-IV	Webinar on …….	C-30	Webinar
Unit-IV	Presentation	C-31	Presentation
Unit-IV	Clarification	C-32	Clarification Class
Unit-IV	Decision Trees		
Unit-IV	What is a Decision Tree?, Tree Construction Principle	C-33	Lecture
Unit-IV	What is a Decision Tree?, Tree Construction Principle	C-34	Lecture
Unit-IV	Best Split, Splitting Indices, Splitting Criteria, Decision Tree Construction Algorithms	C-35	Lecture
Unit-IV	Best Split, Splitting Indices, Splitting Criteria, Decision Tree Construction Algorithms	C-36	Lecture
Unit-IV	CART, ID3, C4.5, Decision Tree Construction with Presorting, RainForest	C-37	Lecture
Unit-IV	Approximate Methods, CLOUDS, BOAT	C-38	Lecture
Unit-IV	Pruning Techniques, Integration of Pruning and Construction, Ideal Algorithm	C-39	Lecture
Unit-IV	Pruning Techniques, Integration of Pruning and Construction, Ideal Algorithm	C-40	Lecture
Unit-IV	Seminar	C-41	Seminar
Unit-IV	Clarification	C-42	Clarification Class
Unit-IV	Presentation	C-43	Presentation
Unit-IV	Assignment	C-44	Class Room Assignment
Unit-IV	Assignment	C-45	Class Room Assignment

CSEE14039- Optimization Techniques in Machine Learning

Unit	Particulars	Class No.	Pedagogy of Class
Unit-I	Basics of Nonlinear Optimization		
Unit-I	Convex sets, convex functions.	C-1	Lecture
Unit-I	Convex sets, convex functions.	C-2	Lecture
Unit-I	Introduction to unconstrained and constrained optimization problems	C-3	Lecture
Unit-I	Introduction to unconstrained and constrained optimization problems	C-4	Lecture
Unit-I	Examples of nonlinear optimization problems: Matrix completion, matrix factorization, least squares	C-5	Lecture
Unit-I	Logistic regression, sparse principal component analysis, expectation maximization	C-6	Lecture
Unit-I	Logistic regression, sparse principal component analysis, expectation maximization	C-7	Lecture
Unit-I	Logistic regression, sparse principal component analysis, expectation maximization	C-8	Lecture
Unit-I	Clarification Class1	C-9	Clarification Class
	Home ASSIGNMENT-1		Home Assignments
	Class Assignment-1	C-10	Class Assignment
Unit-II	Gradient descent (GD) algorithm		
Unit-II	Geometric interpretation.	C-11	Lecture
Unit-II	Why GD works and when it does not work	C-12	Lecture
Unit-II	Strong convexity and condition numbers, choice of the stepsize	C-13	Lecture
Unit-II	First-order optimality conditions for unconstrained problems	C-14	Lecture
Unit-II	Projected GD for constrained problems. Frank-Wolfe algorithm	C-15	Lecture
Unit-II	Projected GD for constrained problems. Frank-Wolfe algorithm	C-16	Lecture
Unit-II	Clarification Class 2	C-17	Clarification Class
	Home ASSIGNMENT-2		Home Assignments
Unit-III	Momentum acceleration		
Unit-III	Momentum acceleration	C-18	Lecture
	Seminar	C-19	Seminar
Unit-III	Nesterov and Polyak's momentum techniques, Adam, AdaGrad algorithms.	C-20	Lecture
Unit-III	Nesterov and Polyak's momentum techniques, Adam, AdaGrad algorithms.	C-21	Lecture
Unit-III	Geometric interpretation.	C-22	Lecture
Unit-III	Geometric interpretation.	C-23	Lecture
Unit-III	Geometric interpretation.	C-24	Guest lecture
Unit-III	Geometric interpretation.	C-25	Clarification Class
Unit-III	Geometric interpretation.	C-26	Quiz
	Home ASSIGNMENT-3		Home Assignments

Unit-IV	Duality theory		
Unit-IV	Lagrangians, duality theory, KKT conditions.	C-27	Lecture
Unit-IV	Lagrangians, duality theory, KKT conditions.	C-28	Lecture
Unit-IV	Lagrangians, duality theory, KKT conditions.	C-29	Webinar
Unit-IV	Examples from support vector machines, constrained least squares	C-30	Lecture
Unit-IV	Examples from support vector machines, constrained least squares	C-31	Lecture
Unit-IV	Examples from support vector machines, constrained least squares	C-32	Lecture
	Presentation	C-33	Presentation
	Presentation	C-34	Presentation
Unit-IV	Empirical risk minimization	C-35	Lecture
Unit-IV	Risk minimization problems, overfitting.	C-36	Lecture
Unit-IV	Risk minimization problems, overfitting.	C-37	Lecture
	Clarification Class 4	C-38	Clarification Class
	Class Room Assignment 2	C-39	Class Assignment
	Class Room Assignment 3	C-40	Class Assignment
Unit-V	Sample average approximation (SAA)		
Unit-V	Sample average approximation (SAA)	C-41	Lecture
Unit-V	Sample average approximation (SAA)	C-42	Lecture
Unit-V	Clarification Class 5	C-43	Clarification Class
	Guest lecture	C-44	Guest lecture
	Webinar	C-45	Webinar

Note: The review of Syllabus happens on periodic basis for the benefit of the students. In case there are changes in curriculum due to review, students would be intimated in writing.

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