Academic Program - UG

Syllabus 2024-25

VII & VIII Semester B.E.

Computer Science and Engineering

SHRI DHARMASTHALA MANJUNATHESHWARA COLLEGE OF ENGINEERING & TECHNOLOGY,
DHARWAD – 580 002
(An Autonomous Institution approved by AICTE & Affiliated to VTU, Belagavi)

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SDM College of Engineering & Technology, Dharwad

It is certified that the scheme and syllabus for VII & VIII semesters of UG program in Computer Science and Engineering is recommended by Board of Studies of Computer Science and Engineering Department and approved by the Academic Council, SDM College of Engineering &Technology, Dharwad. This scheme and syllabus will be in force from the academic year 2024-25 till further revision.

Principal

Chairman BoS & HoD

Department of Computer Science and Engineering

College Vision and Mission

Vision

To develop competent professions with human values

Mission

- To have contextually relevant Curricula.
- To promote effective Teaching Learning Practices supported by Modern Educational Tools and Techniques.
- To enhance Research Culture.
- To involve the Industrial Expertise for connecting Classroom contents to real-life situations.
- To inculcate Ethics and soft-skills leading to overall personality development.

QUALITY POLICY:

In its quest to be a role model institution, committed to meet or exceed the utmost interest of all the stake holders.

Core Values:

- Competency
- Commitment
- Equity
- Team work and Trust

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

VISION

To develop competent professionals in the field of Computer Science and Engineering with human values.

MISSION

1. To have contextually relevant curricula in line with industry trends and body of knowledge stated by IEEE/ACM.
2. To promote OBE based effective Teaching Learning Practices supported by modern educational tools and techniques.
3. To enhance research.
4. To involve the industrial expertise for connecting classroom contents to real-life situations.
5. To inculcate ethics and soft-skills leading to overall personality development.

Program educational Objectives (PEO)

I. To prepare students for successful careers in Industry, Research and Institutions of higher learning

II. To encourage students to work in teams to address industrial and socially relevant problems / projects.

III. To provide students with a sound mathematical, scientific and engineering fundamentals necessary to formulate, analyse and solve engineering problems.

IV. To promote student awareness and commitment to lifelong learning and professional ethics during the course of professional practice.

PROGRAMME OUTCOMES (POs) and Programme Specific Outcomes (PSOs)

Program Outcomes (POs):

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **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.
3. **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.
4. **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.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **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.
11. **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.

12. **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.

Program Specific outcomes (PSOs):

13. **System Inception and Elaboration:** Conceptualize the software and/or hardware systems, system components and process/procedures through requirement analysis, modeling /design of the system using various architectural / design patterns, standard notations, procedures and algorithms.
14. **System Construction:** Implement the systems, procedures and processes using the state-of-the-art technologies, standards, tools and programming paradigms.
15. **System Testing and Deployment:** Verify and validate the systems, procedures and processes using various testing and verification techniques and tools.
16. **System Quality and Maintenance:** Manage the quality through various product development strategies under revision, transition and operation through maintainability, flexibility, testability, portability, reusability, interoperability, correctness, reliability, efficiency, integrity and usability to adapt the system to the changing structure and behavior of the systems /environments

S.D.M. College of Engineering and Technology, Dharwad

VII Semester

Course Code	Course Category	Course Title	Teaching		Examination				
			L-T-P (Hrs/Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
					Max. Marks	*Max. Marks	Duration in Hrs.	Max. Marks	Duration In Hrs.
21UCSC700	PC	Artificial Intelligence and Machine Learning	3-0-0	3	50	100	3	-	-
21UCSE7XX	PE	Program Elective – 3	3-0-0	3	50	100	3	-	-
21UCSE7XX	PE	Program Elective – 4	3-0-0	3	50	100	3	-	-
21UCSC7XX	PE	Program Elective – 5	3-0-0	3	50	100	3	-	-
21UCSO7XX	OE	Open Elective -3	3-0-0	3	50	100	3	-	-
21UHUC700	PC	Research Methodology	2-0-0	2	50	50	2	-	-
21UCSL701	PC	Artificial Intelligence and Machine Learning Laboratory	0-0-2	1	50	-	-	50	3
21UCSL702	PC	Major Project Phase - 1	0-0-4	2	50	-	-	50	3
Total			**17-0-6**	**20**	**400**	**550**	**-**	**100**	**-**

Program Elective – 3:

Course Code	Course Category	Course Title	Teaching		Examination				
			L-T-P (Hrs/Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
					Max. Marks	*Max. Marks	Duration in Hrs.	Max. Marks	Duration In Hrs.
21UCSE720	PE	Distributed Systems and Applications	3-0-0	3	50	100	3	-	-
21UCSE721	PE	Ad-hoc Networks	3-0-0	3	50	100	3	-	-

Program Elective – 4:

Course Code	Course Category	Course Title	Teaching		Examination				
			L-T-P (Hrs/Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
					Max. Marks	*Max. Marks	Duration in Hrs.	Max. Marks	Duration In Hrs.
21UCSE730	PE	Block chain Technology	3-0-0	3	50	100	3	-	-
21UCSE731	PE	Deep Learning and Applications	3-0-0	3	50	100	3	-	-

Program Elective – 5:

Course Code	Course Category	Course Title	Teaching		Examination				
			L-T-P (Hrs/Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
					Max. Marks	*Max. Marks	Duration in Hrs.	Max. Marks	Duration In Hrs.
21UCSE740	PE	Multi Core Architecture and Programming	3-0-0	3	50	100	3	-	-
21UCSE741	PE	Network Management	3-0-0	3	50	100	3	-	-
21UCSE742	PE	High Performance Computing	3-0-0	3	50	100	3	-	-

Open Elective – 3:

Course Code	Course Category	Course Title	Teaching		Examination				
			L-T-P (Hrs/Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
					Max. Marks	*Max. Marks	Duration in Hrs.	Max. Marks	Duration In Hrs.
21UCSO750	OE	Cryptography and Network Security	3-0-0	3	50	100	3	-	-
21UCSO751	OE	Digital Image Processing	3-0-0	3	50	100	3	-	-

VIII Semester

Course Code	Course Category	Course Title	Teaching		Examination				
			L-T-P (Hrs/Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
					Max. Marks	*Max. Marks	Duration in Hrs.	Max. Marks	Duration In Hrs.
21UCSL800	PC	Independent Study	0-0-2	1	50	-	-	-	-
21UCSL801	PC	Major Project Phase - 2 (in Industry / College / through Internship)	0-0-18	9	50	-	-	50	3
21UCSL802	PC	Internship – 2	4-6 Weeks	3	50	-	-	50	3
Total			**0-0-20**	**13**	**150**	**-**		**100**	

VII Semester

21UCSC700 Artificial Intelligence and Machine Learning (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course focuses on following learning perspectives:
To introduce the basic concepts, theories and state-of-the-art techniques of artificial intelligence and machine learning.
Enable student with knowledge enough to be a self-learner in exploring the application of machine learning /AI algorithms in the different fields of science, medicine, finance etc.

Course Outcomes (Cos):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to Pos(1-12)/ PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Explain** the search techniques for any real time problems.	-	3,4	1,2
CO-2	**Apply** Knowledge representation using First order logic for making decisions.	-	3,4	1,2
CO-3	**Apply** regression and classification techniques for prediction	-	3,4	-
CO-4	**Apply** the concepts of machine learning to the real-world problems.	-	3,4	-
CO-5	**Demonstrate** machine learning techniques to solve complex problems.	3		

Pos/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Mapping Level	1.0	1.0	2.0	2.0	2.5	-	-	-	-	-	-	-	-	-	-	-

Pre-requisites: Knowledge of
Python Programming Fundamentals

Contents:

Unit-I

Introduction: AI Problems Underlying Assumption, AI Techniques, Criteria for Success

State Space Search & Heuristic Search Techniques: Defining the Problems as A State Space Search, Production Systems, Searching Techniques like Informed and Uniformed Search.

Generate And-Test: Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, and Means-ends Analysis. **08 Hrs**

Unit-II

Knowledge Representation: Issues, Representations and Mappings, Approaches to Knowledge Representation.

Using Predicate Logic: Representing, Computable Functions and Predicates, Resolution. Representing Knowledge Using Rules, Procedural Versus Declarative Knowledge, Forward Versus Backward Reasoning. **08Hrs**

Unit-III

Linear Regression: Multivariate Regression, Logistic regression, Polynomial Regression.

Linear Models for Classification: Decision Trees, Regression Trees, K-nearest neighbors (KNN) algorithm. Bayes Theorem. **08 Hrs**

Unit-IV

Unsupervised learning and clustering – k-means clustering, hierarchical clustering, generative adversarial network, Dimensionality Reduction **07 Hrs**

Unit-V

Perceptron: Neural Networks – Introduction, Early Models, Perceptron Learning, Backpropagation, Initialization, Training & Validation, Support Vector Machines, Introduction, Early Models. **08 Hrs**

Reference Books:

1. Elaine Rich and Kevin Knight “Artificial Intelligence”, 2/E, Tata Mcgraw-Hill, 2005.
2. Stuart Russel and Peter Norvig, “Artificial Intelligence: A Modern Approach”, 3/E, Prentice Hall, 2009.
3. Trevor Hastie, Robert Tibshirani, and Jerome H. Friedman “The Elements of Statistical Learning”.
4. Christopher Bishop, “Pattern Recognition and Machine Learning”
5. Mitchell Tom “Machine Learning”, McGraw Hill, 1997.

21UHUC700	Research Methodology	(2-0-0) 2

Contact Hours: 26

Course Learning Objectives (CLOs):

The students are expected to learn about the need and types of research, problem formulation, literature review, measurement, scaling, data collection, testing of hypothesis, result interpretation and report writing.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs (1-12)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Formulate the research problem, carryout literature survey and decide the methodology.	-	1	-
CO-2	Use measurement and scaling and carryout data collection.	-	1	-
CO-3	Test the hypothesis, interpret &analyze the results and write the report.	2	3	-
CO-4	Explain the need for interpretation and report writing	-	2	-

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**
Mapping Level	2	2.2	2	-	-	-

Pre-requisites:

Branch specific course on problem analysis (Preferred)

Contents:

Unit-I

Research Methodology: Introduction, meaning of research, objectives of research, motivation in research, types of research, research approaches, significance of research, research methods versus methodology.

Defining the Research Problem: Research problem, selecting the problem, necessity of defining the problem, technique involved in defining a problem, an illustration.

06 Hrs

Unit-II

Reviewing the literature: Importance of the literature review in research, How to review the literature, searching the existing literature, reviewing the selected literature and writing about the literature reviewed.

Research Design: Meaning of research design, need for research design, features of a good design, important concepts relating to research design. **05 Hrs**

Unit-III

Measurement and Scaling: Measurement in research, measurement scales, sources of error in measurement, scaling, meaning of scaling and important scaling techniques.

Data Collection: Collection of primary data, observation method, interview method, collection of data through questionnaires. **05 Hrs**

Unit-IV

Testing of Hypotheses: What is a Hypothesis? Basic concepts concerning testing of hypotheses, procedure for hypothesis testing, flow diagram for hypothesis testing, measuring the power of a hypothesis test, tests of hypotheses. **05 Hrs**

Unit-V

Interpretation and Report Writing: Meaning of interpretation, technique of interpretation, precaution in interpretation, significance of report writing, different steps in writing report, layout of the research report, types of reports, oral presentation and mechanics of writing a research report, precautions for writing research reports, plagiarism and its significance. **5 Hrs.**

Reference Books:

1. C.R. Kothari, Gaurav Garg, Research Methodology: Methods and Techniques, New Age International, 4 th Edition, 2018.
2. RanjitKumar, Research Methodology a step-by-step guide for beginners, SAGE Publications, 3rdEdition, 2011.
3. Fink A, Conducting Research Literature Reviews: From the Internet to Paper, Sage Publications, 2009.

21UCSL701 Artificial Intelligence and Machine Learning Laboratory (0-0-2) 1

Contact Hours: 26

Course Learning Objectives (CLOs): This course is in line with the theory course Artificial Intelligence & Machine Learning (22UCSC602). It focuses on hands on experience on creation of data models, database design, programming using appropriate technology.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course, the student will be able to:		**Mapping to POs(1-12) / PSOs(13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Represent** the Knowledge for the given scenario using appropriate tools techniques and language.	-	3,4,5	-
CO-2	**Identify** data preprocessing requirement of a given data set for the learning algorithms.	-	3,4,5	-
CO-3	**Demonstrate** of the strengths and weaknesses of regression and classification approaches in machine learning.	-	3,4,5	-
CO-4	**Demonstrate** unsupervised algorithms for clustering requirement on a data set from the real world using python.	-	3,4,5	-
CO-5	**Represent** the Knowledge for the given scenario using appropriate tools techniques and language.	-	3,4,5	-

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Mapping Level	-	-	2.0	2.0	2.0	-	-	-	-	-	-	-	-	-	-	-

Pre-requisites: Knowledge of

1. Logic
2. Discrete Mathematics
3. Programming Fundamentals

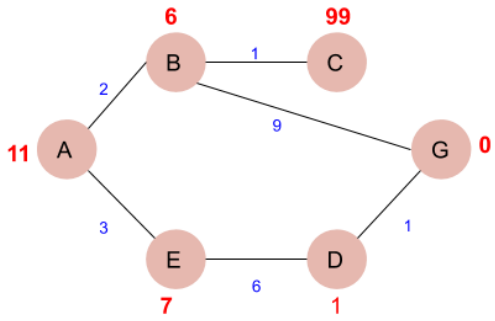
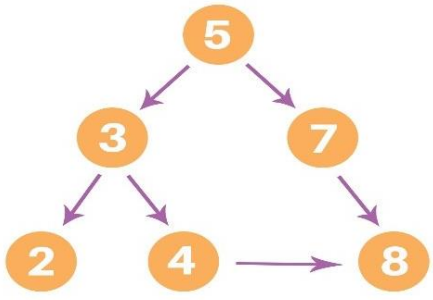
Course Contents

This course is in line with the theory course Artificial Intelligence & Machine Learning (18UCSC700). There will be one problem with the **Knowledge Representation** and four problems on **Machine Learning** (Linear Regression, Multilinear regression,

Polynomial regression, Decision Tree, K-means clustering). The problems to be composed by the faculty are announced to the students. The student will analyze the problem, justify the requirement of AI Approach for the solution, choose the platform or technology for implementations and demonstrate all the steps involved like pre-processing the dataset, importing the dataset, Spitting the dataset into the training set and test set, training the model on the training dataset, predicting the test set results, Visualising the Training set results, Visualising the test set results, etc where ever applicable. The students will submit implementation, conduction and observation write up for each problem. An internal examination and 5 problems work will be used to grade the student's performance in this course.

AIML Lab Term-Work 2024

Course Code : 22UCSL603 Course : AI&ML LAB

1. Implement A* searching Algorithm for the graph given below.  The numbers written on edges represent the distance between the nodes while the numbers written on nodes represent the heuristic values. Let us find the most cost-effective path to reach from start state A to final state G
2. Implement BFS for given graph 
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Write a program to implement linear regression for salary prediction.

5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

21UCSL702 Major Project Phase – 1 (0-0-4) 2

Contact Hours: 52

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:
Understand the domain through proper modeling and analysis using the state-of-art technology. Then apply relevant Software Engineering Principles to develop modular and robust applications through the use of Standards and tools. At the end build appropriate test cases, verification and validation techniques in order to make the project reliable and maintainable.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12) / PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Identify** the problem and **formulate** the problem statement.	1, 8, 2,12	-	-
CO-2	**Analyze** the problem scenario and **Design** the solutions to complex engineering problem using software engineering principles or appropriate research methodology.	3,5, 8, 13,12	11, 16	6, 7
CO-3	**Identify** and **Implement** a feasible solution using appropriate technology, tools, procedures and techniques.	4,5, 8, 14,12	16	-
CO-4	**Verify** and **Validate** the proposed system for correctness and to demonstrate compliance with the design and hence the stated requirements/ research gap.	5, 8, 15,12	-	-
CO-5	**Prepare** the report and **communicate** effectively through presentation.	8, 9,10	-	-

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mapping Level	3	3	3	3	3	1	1	3	3	3	2	3	3	3	3	2

Prerequisites: Different programming languages / tools, Software Engineering Principles

Marks Weightage and Various parameters for project evaluation for both CIE and SEE level at 7th and 8th Semester:

Sl.No.	Parameter for Assessment	% Weight For CIE and SEE	
		7th Sem	8th Sem
1	**Requirements Analysis (SRS):** Abstract and Detailed.	20	10
2	**Design Specification:** Use of UML diagrams, architecture diagram, ER diagram, Patterns etc. Proper cohesiveness and coupling of various components in the system design.	35	10
4	Use of Tools and standards.	5	5
5	**Implementation:** Code documentation, style, robustness, maintainability, Testability, Usability (User Experience) etc.	10	20
6	**Testing:** for every scenario of all use cases identified.	10	10
7	**Final Oral Presentation** (viva-voce) (IEEE Standards for slides, oral presentation techniques, etc.)	10	10
8	**Project Reports** - Final and Intermediate if any: preparation using LATEX and plagiarism check	10	20
9	**Preparation of Learning Materials** (.doc & .pdf) & **Videos**: Uploading through Department Channel on YouTube. **Knowledge Transfer**: through conduction of workshop and training programs	-	10
10	**Publication of paper / Equivalent Effort** (@IEEE or equivalent or higher)	-	5

References:

1. Grady Booch, “Object-Oriented Analysis and Design with Applications”, Second Edition, Addison-Wesley Publications.
2. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Third Edition, Springer Publications.
3. Project Manual, prepared by the CSE Department, S D M College of Engineering and Technology, Dharwad

21UCSE720 Distributed Systems and Applications (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course is at undergraduate level for 4 credits with emphasis on the principles of distributed systems and to design the solutions for message passing, clock synchronization, consistency and fault tolerance at basic level.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Explain** the characteristics and functioning of communication protocols in distributed systems.	-	1,2,13	-
CO-2	**Comprehend** the need for synchronization strategies in a distributed system and **Implement** a synchronization algorithm.	13,14	1,3,5,15	2
CO-3	**Explain** principles of consistency and replication strategies in a distributed system.	-	1,2,13	-
CO-4	**Elucidate** the principles of fault tolerance strategies in a distributed system.	-	1,2,13	-
CO-5	**Explain** the characteristics of distributed file system and **Implement** the file system operations of a distributed operating system.	13,14	1,3,5,15	2

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Mapping Level	2.0	1.6	2.0	-	2.0	-	-	-	-	-	-	-	2.4	3.0	2.0	-

Pre-requisites: Knowledge of

- Computer Networks
- Operating Systems

Contents:

Unit-I

Introduction: Need for distributed system and applications, process and communication model (in terms of IPCs RPCs, RMIs and software agents), architecture & design patterns. **7 Hrs**

Unit-II

Naming: Terminologies and different types of naming services.
Synchronization : Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning of Nodes, Election Algorithms **9 Hrs**

Unit-III

Consistency and Replication: Introduction, Data-centric Consistency Models, Client-centric Consistency Models, Replica Management. **8 Hrs**

Unit-IV

Fault Tolerance & Security: Introduction, Process Resilience, Reliable Client-Server Communication, Reliable Client-Server Communication, Security and design issues in distributed system. **8 Hrs**

Unit-V

Distributed file systems: client-server architectures, cluster-based distributed file systems, symmetric architectures and processes. **7 Hrs**

Reference Books:

1. Andrew S Tanenbaum & Maarten van Steen, "Distributed Systems Principles and Paradigms", 2nd Edition, Pearson Prentice Hall, 2007.
2. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly, 2015,
3. George Coulouris, Jean Dollimore, Tim Kindberg & Gordon Blair, "Distributed Systems Concepts and Design", 5th Edition, Addison-Wesley, 2012.
4. Ghosh, Sukumar. Distributed systems: an algorithmic approach. Chapman and Hall/CRC, 2006.

21UCSE721 Ad-hoc Networks (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course covers major aspects of wireless ad hoc networks, from design through performance issues to application requirements. It starts with characteristics features, applications of wireless ad hoc networks, different types of routing protocols and understanding the security issues and various QoS requirements.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/ PSOs (13-16)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Explain** the design issues of protocol stack.	-	3,13	-
CO-2	**Compare** the architecture and working of various MAC layer protocols.	-	16	1,14
CO-3	**Apply** the knowledge of different routing mechanisms for the better routing decisions in WANETs.	3,13,16	-	-
CO-4	**Apply** the knowledge of different transport layer protocols for ensuring reliable communication in WANETs.	3,13	16	15
CO-5	**Identify** the challenges in security and QoS issues in WANETs and explain suitable solutions for the same.	-	2	1,16

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mapping Level	1.0	2.0	2.7	-	-	-	-	-	-	-	-	-	2.7	1.0	1.0	1.7

Pre-requisites: Knowledge of

- Data Communications
- Computer Networks
- C programming

Contents:

Unit-I

Adhoc Networks: Introduction, Issues in Adhoc wireless networks, Adhoc wireless internet.

MAC–1: MAC Protocols - Introduction, Issues in designing a MAC protocol, Design goals of a MAC protocol for Adhoc wireless networks. **7 Hrs**

Unit-II

MAC–2: Classification of MAC protocols, Contention based protocols with reservation mechanisms; Contention based MAC protocols with scheduling mechanism, MAC protocols that use directional antennas, Other MAC protocols. **7 Hrs**

Unit-III

Routing: Proactive and Reactive Routing Protocols, Hybrid routing protocol, Routing protocols with effective flooding mechanisms, Hierarchical routing protocols, Power aware routing protocols. **9 Hrs**

Unit-IV

Transport Layer: Protocols - Introduction, Issues in designing a transport layer protocol, Design goals of a transport layer protocol, Classification of transport layer solutions, TCP over Ad hoc wireless Networks, Other transport layer protocols. **9 Hrs**

Unit-V

Security: Introduction, Network security requirements, Issues & challenges in security provisioning, Network security attacks, Key management, Secure routing.
QoS: Introduction, Issues and challenges in providing QoS, Classification of QoS solutions, MAC layer solutions, network layer solutions. **7 Hrs**

Reference Books:

1. C. Siva Ram Murthy & B. S. Manoj, "Adhoc Wireless Networks", 2nd Edition, Pearson Education, 2005.
2. Ozan K. Tonguz and Gianguigi Ferrari & John Wiley, "Ad hoc Wireless Networks", 2006.
3. Xiuzhen Cheng, Xiao Hung, Ding Zhu Du, & Kluwer, "Ad hoc Wireless Networking", Academic Publishers, 2004.
4. C.K. Toh, "Adhoc Mobile Wireless Networks, Protocols and Systems", Prentice Hall PTR, 2007.

21UCSE730 Blockchain Technology (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course focuses on understanding emerging abstract models for Blockchain Technology and familiarizes the functional/operational aspects of the crypto currency ecosystem. Identify major research challenges and technical gaps existing between theory and practice in the crypto currency domain.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Demonstrate** the basics of Block chain concepts using modern tools/technologies.	-	3, 4, 5	1,13
CO-2	**Analyze** the role of block chain applications in different domains including cyber security.	-	3, 5	-
CO-3	**Evaluate** the usage of Block chain implementation/features for the given scenario.	-	1, 3, 4	14
CO-4	**Exemplify** the usage of bitcoins and its impact on the economy.	3	-	-

CO-5	**Analyze** the application of specific block chain architecture for a given problem.	3	2	6

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mapping Level	1.0	2.4	1	2	1	-	-	-	-	-	-	-	1.0	1.0	-	-

Pre-requisites: Knowledge of any Object Oriented Programming language and Data Structures.

Contents:

Unit-I

Introduction: Introduction to Blockchain, How Blockchain works, Blockchain vs. Bitcoin, Practical applications, public and private key basics, pros and cons of Blockchain, Myths about Bitcoin. **7 Hrs**

Unit-II

Blockchain Architecture and Types: Architecture, versions, variants, use cases, Life use cases of Blockchain, Blockchain vs. shared Database, Introduction to crypto currencies, Types, Applications. **8 Hrs**

Unit-III

Blockchain Data Structures and Working: Concept of Double Spending, Hashing, Mining, Proof of work. Introduction to Merkel tree, Privacy, payment verification, Resolving Conflicts, Creation of Blocks. **8 Hrs**

Unit-IV

Bitcoins: Introduction to Bitcoin, key concepts of Bitcoin, Merits and Demerits Fork and Segwits, Sending and Receiving bitcoins, choosing bitcoin wallet, Converting Bitcoins to Fiat Currency. **8 Hrs**

Unit-V

Ethereum: Introduction to Ethereum, Advantages and Disadvantages, Ethereum vs. Bitcoin, Introduction to Smart contracts, usage, application, working principle, Law and Regulations. Case Study. **8 Hrs**

Reference Books:

1. Arshdeep Bikramaditya Signal, Gautam Dhameja, Priyanshu Sekhar Panda “Beginning Blockchain: A Beginner's Guide to Building Blockchain Solutions” Apress Publications, 2018.
2. Arshdeep Bahga, Vijay Madisetti, “Blockchain Applications: A Hands-On Approach”, VPT Publications, 2017.

3. Swan Melanie, “Blockchain: Blueprint for New Economy”, O’Reilly Publications, 2018.
4. Aravind Narayan, Joseph Bonneau, Edward Felten at al “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction” Princeton University Press, 2016
5. Daniel Drescher, “Blockchain Basics: A Non-Technical Introduction in 25 Steps”, Apress Publications, 2017.

Additional References:

1. https://www.guru99.com/blockchain-tutorial.html
2. https://developer.ibm.com/technologies/blockchain/gettingstarted/

22UCSE731 Deep Learning and Applications (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

This is a 3 credit elective course at undergraduate level focusing on the architecture of Deep Learning and building blocks used in the Deep Learning based solutions. Students learn about feedforward neural networks, convolutional neural networks, recurrent neural networks and various optimization algorithms.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12) / PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Explain the basic principles of machine learning.	-	1	-
CO-2	Explain the fundamental architecture of deep feedforward networks and regularization strategies	-	1	-
CO-3	Explain optimization techniques for Deep Models.	-	1	-
CO-4	Explain and Apply CNN functions and algorithms for the given problem scenario.	-	1,2,3	14
CO-5	Explain sequence models and its applications	-	1,2,3	14
CO-6	Explain various application of deep learning in various domains	-	1,2,3	14

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Mapping Level	2	2	2	-	-	-	-	-	-	-	-	-	-	1	-	-

Prerequisites: Knowledge of Linear Algebra, probability and Machine Learning..

Contents:

Unit-I

Machine Learning Basics: Learning Algorithms, Capacity, Overfitting and Under fitting Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning. **08 Hrs**

Unit-II

Deep Feedforward Networks: Example: Learning XOR, Gradient-Based Learning. . Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms, Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under- Constrained Problem, Dataset Augmentation, Noise Robustness, Semi- Supervised Learning, Multi- Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop, and Manifold Tangent Classifier. **09 Hrs**

Unit-III

Optimization for Training Deep Models: How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with AdaptiveLearning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta Algorithms **08 Hrs**

Unit-IV

Convolutional Networks: The Convolution Operation,Motivation,Pooling, Convolution and Pooling as an Infinitely Strong Prior,Variants of the Basic Convolution Function,Structured Outputs,Data Types,Efficient Convolution Algorithms, Random or Unsupervised Features **08 Hrs**

Unit-V

Recurrent Neural Network (RNN) : Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder- Decoder Sequence-to Sequence Architectures, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short-Term Memory

Applications: Large Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing. **08 Hrs**

Reference Books:

1. Ian Good fellow and Yoshua Bengio and Aaron Courville, Deep Learning, An MIT Press book,2016.
2. Francois Chollet, Deep Learning with Python, Manning Publications, 2017, ISBN-10, 9781617294433.
3. Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola,Dive into Deep Learning Release 0.8.0, 2020.
4. C. M. Bishop, Pattern Recognition and Machine Learning (Information Science and Statistics),Springer, 2006.

21UCSE740 Multi Core Architecture and Programming (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course focuses on following learning perspectives:

- Basic concepts in multicore architecture.
- Synchronization and coordination mechanisms available on latest multicore machines.
- Effective concurrent program writing to enhance the performance for windows, C# & .net and Linux programming platforms.
- Introductory knowledge in Open MP libraries and pthreads.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Explain** the need for multicore architecture for modern day applications	1	2	13
CO-2	**Write** a program using pthread libraries and Open MP features to solve problems that needs thread models.	2	5	13
CO-3	**Write** a program to solve problems using parallel programming constructs.	-	4	5
CO-4	**Design** a solution for the problem using APIs for Win32, MFC and .NET;	-	5	-
CO-5	**Apply** standard solutions to some common parallel programming problems like data Race conditions, Dead locks, Live locks, Memory Issues etc.	2	3	1

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mapping Level	2.0	2.7	2.0	2.0	2.7	-	-	-	-	-	-	-	1.0	-	-	-

Pre-requisites: Knowledge of

- Microprocessor
- Operating Systems
- C programming

Contents:

Unit-I

Introduction to Multi-core Architecture: Motivation for Concurrency in software, Parallel Computing Platforms, Parallel Computing in Microprocessors, Differentiating Multi-core Architectures from Hyper-Threading Technology, Multi-threading on Single-Core versus Multi-Core Platforms Understanding Performance, Amdahl's Law, Growing Returns: Gustafson's Law.

System Overview of Threading: Defining Threads, System View of Threads, Threading above the Operating System, Threads inside the OS, Threads inside the Hardware, What Happens When a Thread Is Created, Application Programming Models and Threading, Virtual Environment: VMs and Platforms, Runtime Virtualization, System Virtualization. **8 Hrs**

Unit-II

Fundamental Concepts of Parallel Programming: Designing for Threads, Task Decomposition, Data Decomposition, Data Flow Decomposition, Implications of Different Decompositions, Challenges You'll Face, Parallel Programming Patterns, A Motivating Problem: Error Diffusion, Analysis of the Error Diffusion Algorithm, An Alternate Approach: Parallel Error Diffusion, Other Alternatives. **8 Hrs**

Unit-III

Threading and Parallel Programming Constructs: Synchronization, Critical Sections, Deadlock, Synchronization Primitives, Semaphores, Locks, Condition Variables, Messages, Flow Control- based Concepts, Fence, Barrier, Implementation-dependent Threading Features. Threading APIs: Threading APIs for Microsoft Windows, Win32/MFC Thread APIs, Threading APIs for Microsoft. NET Framework, Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads, Creating Threads, Managing Threads, Thread Synchronization, Signaling, Compilation and Linking. **8 Hrs**

Unit-IV

Open MP: A Portable Solution for Threading: Challenges in Threading a Loop, Loop-carried Dependence, Data-race Conditions, Managing Shared and Private Data, Loop Scheduling and Portioning, Effective Use of Reductions, Minimizing Threading Overhead, Work-sharing Sections, Performance oriented Programming, Using Barrier and No wait, Interleaving Single-thread and Multi-thread Execution, Data Copy-in and

Copy-out, Protecting Updates of Shared Variables, Intel Task queuing Extension to Open MP, Open MP Library Functions, Open MP Environment Variables, Compilation, Debugging, performance. **8 Hrs**

Unit-V

Solutions to Common Parallel Programming Problems: Too Many Threads, Data Races, Deadlocks, and Live Locks, Deadlock, Heavily Contended Locks, Priority Inversion, Solutions for Heavily Contended Locks, Non-blocking Algorithms, ABA Problem, Cache Line Ping-ponging, Memory Reclamation Problem, Recommendations, Thread-safe Functions and Libraries, Memory Issues, Bandwidth, Working in the Cache, Memory Contention, Cache-related Issues, False Sharing, Memory Consistency. **7 Hrs**

Reference Books:

1. Shameem Akhter & Jason Roberts "Multicore Programming Increased Performance through Software Multi-threading", Intel Press, 2006
2. The Software Optimization Cookbook – Intel Press 2007
3. M.Shyamala Devi, "Multicore Architectures and Programming", Sahara Publications, 2016
4. Krishna Sankar P & Shangarnarayanee N P, "Multi-Core Architectures and Programming", AR Publications, 2016.

21UCSE741 Network Management (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course, at under graduate level for 3 credits, explains the issues for network management arising from a range of security threats, including viruses and denial-of-service attacks. Develop a strategy for ensuring appropriate levels of security in a system designed for a particular purpose.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Explain** network communication architecture and goals	2,13	-	-
CO-2	**Explain** and **apply** Management information Tree (MIT)	13,14	3, 4	5
CO-3	**Explain** structure of management through Management Information Base	13	4	3
CO-4	**Explain** Remote Monitoring, and concept of broadband, security.	-	4,5	7
CO-5	**Design** and **develop** network	-	10	-

	management solutions for the given scenario like Inventory management, fault location and management, performance management, accounting management, report management.			

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mapping Level	-	3.0	2.0	2.0	1.5	-	1.0	-	-	2.0	-	-	3.0	3.0	-	-

Pre-requisites: Knowledge of Computer Networks

Contents:

Unit-I

Introduction: Some Common Network Problems; Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions Goal of Network Management, Network Provisioning, Network Operations and the NOC, Network Installation and Maintenance; Network and System Management, Network Management System platform, Current Status and Future of Network Management

Basic Foundations: Standards, Models, and Language: Network Management Standards, Network Management Model, Organization Model, Information Model – Management Information Trees, Managed Object Perspectives, Communication Model; ASN.1 Terminology, Symbols and Conventions, Objects and Data Types, Object Names, An Example of ASN.1Prere from ISO 8824; Encoding Structure; Macros, Functional Model. **8 Hrs**

Unit-II

SNMPv1 Network Management : Organization and Information Models : Managed Network: The History of SNMP Management, Internet Organizations and standards, Internet Documents, The SNMP Model, The Organization Model, System Overview, The Information Model – Introduction, The Structure of Management Information, Managed Objects, Management Information Base **8 Hrs**

Unit-III

SNMPv1 Network Management: Communication and Functional Models: The SNMP Communication Model – The SNMP Architecture, Administrative Model, SNMP Specifications, SNMP Operations, SNMP MIB Group, and Functional Model.

SNMP Management- RMON: Remote Monitoring, RMON SMI and MIB, RMONI1 RMON1 Textual Conventions, RMON1 Groups and Functions, Relationship Between Control and Data Tables, RMON1 Common and Ethernet Groups, RMON Token Ring Extension Groups, RMON2 – The RMON2 Management Information Base, RMON2.

8 Hrs

Unit-IV

Broadband Network Management: ATM Networks: Broadband Networks and

Services, ATM Technology – Virtual Path Virtual Circuit, TM Packet Size, Integrated Service, SONET, ATM LAN Emulation, Virtual LAN; ATM Network Management – The ATM Network Reference Model, The Integrated Local Management Interface, The ATM Management Information Base, The Role of SNMP and ILMI in ATM Management, M1 Interface: Management of ATM Network Element, M2 Interface: Management of Private Networks, M3 Interface: Customer Network Management of Public Networks, M4 Interface: Public Network Management, Management of LAN Emulation. ADSL Architecture, ADSL Channeling Schemes, ADSL Encoding Schemes; ADSL Management ADSL Network Management Elements **8 Hrs**

Unit-V

Network Management Tools: Introduction to various network management tools. Server Management: Application Servers, Web Server. Device configuration like Fire wall settings, Hot Spot, Gate Ways, Switches etc. **7 Hrs**

Experiments:

1. Analyze bandwidth throughput etc. for a given network.
2. Analyze different protocols performance like TCP and UDP for a given point-to-point network.
3. Analyze routing protocol performance.

Reference Books:

1. Mani Subramanian, "Network Management Principles and Practice", 2nd Edition, Pearson Education Publication, 2010.
2. Jianguo Ding, "Advances in Network Management", 1st Edition, Auerbach Publications, 2016.
3. Allan Leinwand, Karen Fang Conroy, & Karen Fang, "Network Management: A Practical Perspective", Addison Wesley, 1996
4. Alexander Clemm, "Network Management Fundamentals", Cisco, 1st Edition, 2016.

21UCSE742 High Performance Computing (3-0-0) 3

Contact Hours:39

Course Learning Objectives (CLOs):

This 39-hour course intends to provide introductory knowledge of parallel architecture, design and analysis of parallel algorithms and parallel programming.

Course Outcomes (COs):

CO	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs (1 to 6)		
		Substantial Level(3)	Moderate Level(2)	Slight Level(1)

CO-1	**Explain** the need for parallelism with scientific and business applications and scope for parallel computing.	1,3	2	5
CO-2	**Estimate** the performance of computing systems using Amdahl's law and SPEC rating.	1	2	-
CO-3	**Explain** the parallel computing architectures and models and their communication models, **Design** parallel algorithm for a given scenario.	1	-	6
CO-4	**Understand** the design principles of parallel algorithms.	3	2	-
CO-5	**Write** and **execute** the MPI and OpenMP programs.	2	-	-

Mapping level:

POs/PSOs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
Mapping Level	3.0	2.4	2.0	-	1.0	1.0

Prerequisites: Knowledge of

- Computer Organization
- High level Programming course
- Assembly Language Programming

Contents:

Unit-I

Introduction to parallel computing: Motivating Parallelism, Scope for Parallel Computing; Flynn's classification of architectures. Need for parallel computers Models of computation Analyzing parallel algorithms

Self Study : High end processors, GPUs etc., **6 Hrs**

Unit-II

Performance Measurement Techniques: Benchmark programs, SPEC ratings, Amdahl's law. **6 Hrs**

Unit-III

Parallel Programming Platform: Implicit parallelism, Limitations of Memory System Performance, Dichotomy of Parallel Computing, Physical organization of Parallel Platforms, Communication Costs in Parallel Machines, Inter Connection Networking and Routing. **9 Hrs**

Unit-IV

Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping techniques for load balancing, Methods for Containing Interaction Overhead, Parallel Algorithm Models. **7 Hrs**

Unit-V

Message Passing Programming: Message passing Model, Message Passing Interface, Circuit Satisfiability, (MPI_Init, MPI_Comm_rank, MPI_Comm_size, MIP_Finalize, Compiling and Running MPI Programs), Introducing Collective Communication.

Shared Memory Programming: Parallel for loop, declaring private variables, critical sections, Reductions, performance improvements **11 Hrs**

Reference Books:

1. Introduction to Parallel Computing : Anant Grama, Anshul Gupta ,George Karpis,Vipin Kumar, second edition, 2011,Pearson
2. Parallel Programming: Michel J Quinn 2009 Tata McGrawHill
3. Jonathan Lazer et al "Research Methods in Human Computer Interaction", 2nd Edition, Morgan Kaufmann Publication 2017.

21UCSO750 Cryptography and Network Security (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

- Principles of Cryptographic algorithms including secret key cryptography, hashing and public key algorithms.
- Use of cryptographic techniques to establish security in modern information- and communication systems.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Compare** and **contrast** different symmetric key encryption techniques to achieve data confidentiality.	-	1, 2	-
CO-2	**Apply** different security solutions for a given system using private and public key cryptography.	13	1, 2	-
CO-3	**Identify** the need for key	-	3	-

	management and message authentication; critically **compare** various key management, and authentication services and mechanisms.			
CO-4	**Identify** and **explain** the requirement and usage of security services and mechanisms for various network security applications.	2	-	1
CO-5	Critically **compare** system threats and countermeasures.	-	-	13
CO-6	**Implement** a given cryptographic algorithm using higher level programming languages.	4, 5, 15	14	

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mapping Level	1.7	2.3	2.0	3.0	3.0	-	-	-	-	-	-	-	2.0	2.0	3.0	-

Pre-requisites: Knowledge of

- Computer Networks
- Discrete Structures

Contents:

Unit-I

Classical Encryption Techniques: Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques.

Block Ciphers and the data encryption standard: Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES. **8 Hrs**

Unit-II

Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. Public-key cryptanalysis. The RSA algorithm, description of the algorithm.

Other Public-Key Cryptosystems: Diffie hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, abelian groups, elliptic curves over real numbers, elliptic curves over Zp **8 Hrs**

Unit-III

Key Management and Distribution: Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, decentralized key control, controlling key usage,

Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication.

User Authentication: Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication,one-way Authentication, Kerberos, Motivation, Kerberos version 4, Kerberos version 5 **8 Hrs**

Unit-IV

Wireless network security: 802.11i pseudorandom Wireless security, Wireless network threats, Wireless network measures, mobile device security, security threats, mobile device security strategy, IEEE 802.11 Wireless LAN overview

Transport Level Security: Web Security Considerations, Web Security Threats, Web Traffic Security Approaches. Secure Sockets Layer: SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, and shake Protocol, Transport Layer Protocol, Connection Protocol. **8 Hrs**

Unit-V

Electronic Mail Security: Pretty good privacy, notation, operational description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality.

IP Security: IP Security overview, applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database. **7 Hrs**

Reference Books:

1. William Stallings, “Cryptography and Network Security”, 6th Edition, Pearson Education, 2014.
2. Atul Kahate, “Cryptography and Network Security”, 3rd Edition, McGraw-Hill Education (India) Pvt. Ltd., 2013
3. Bruce Schinner, “Applied Cryptography”, 2nd Edition, PHI publication 2007.
4. Radia Perlman, Mike Speciner, & Charlie Kaufman, “Network Security: Private communication in a Public World”, 2nd Edition, Pearson Education Asia, 2002.

21UCSO751	Digital Image Processing	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course focuses on the following learning objectives:

- To learn fundamental theories and techniques of digital image processing.
- To acquire the skill necessary to explore advanced topics of digital image processing.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:	**Mapping to POs(1-12)/ PSOs (13-16)**		
	Substantial	**Moderate**	**Slight**

		Level (3)	Level (2)	Level (1)
CO-1	**Describe** the principles of Digital Image Processing.	-	1,2	3,5,13,14
CO-2	**Demonstrate** the image enhancement techniques that include primitives image sensing and acquisition techniques, image formation, image representation & relationship between the pixels.	13,14	1,2,3	15
CO-3	**Explain** the basic principles of mathematical morphology & **write** program to **extract** the characteristic features of image using morphological operations.	13,14	1,2,3	15
CO-4	**Apply** segmentation techniques for a given application scenario.	13,14	1,2,3	15
CO-5	**Explain** and **implement** the core princples of image representation techniques.	13,14	1,2,3	15

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mapping Level	2.0	2.0	1.8	-	1.0	-	-	-	-	-	-	-	2.6	2.6	1.0	-

Pre-requisites: Knowledge of

- Basics of Statistics
- Linear Algebra

Contents:

Unit-I

Digital Image Fundamentals - Introduction, Applications, Fundamental Steps in Digital Image Processing, Elements of visual perception, Image sensing and acquisition, Image Sampling and Quantization, Basic relationships between pixels.

8 Hrs

Unit-II

Intensity Transformations and Spatial Filtering - Basic Intensity Transformation Functions, Histogram Processing; Fundamentals of Spatial Filtering., Smoothing and Sharpening Spatial filters. **8 Hrs**

Unit-III

Morphological Image Processing- Erosion and Dilation, Opening and Closing, Hit or Miss Transforms, Basic Morphological Algorithms, GrayScale Morphology. **8 Hrs**

Unit-IV

Image Segmentation- Point, Line, and Edge Detection, Thresholding, Region-Based

Segmentation, Segmentation Using Morphological Watersheds. **8 Hrs**

Unit-V

Representation and Description- Image Representation, Boundary and Regional Descriptors **7 Hrs**

Reference Books:

1. Rafel C Gonzalez & Richard E Woods, “Digital Image Processing”, 3rd Edition, Pearson Education, 2016.
2. Milan Sonka, Vaclav Hlavac & Roger Boyle, “Image Processing, Analysis and Machine Vision”, 2nd Edition, Thomoson Learning, 2001.
3. Anil K Jain, “Fundamentals of Digital Image Processing”, Prentice-Hall of India Pvt. Ltd., 1997.

B.Chanda & Dutta Majumder, “Digital Image Processing and Analysis”, Prentice-Hall, India, 2002.

VIII Semester

21UCSL800 Independent Study (0-0-2) 1

Contact Hours: 26

Course Learning Objectives (CLOs): This course is a one credit self-learning based research / Development oriented activity leading to publication or a study of subjects outside regular UG course offerings; enabling the students to engage in independent and life-long learning in the broadest context of trends of technological change and 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.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Learn** a technical report independently through self-learning mode.	12	2,3,5,8	-
CO-2	**Prepare** a technical report with a given specification and standards.	10	5	-
CO-3	**Present** effectively the knowledge through verbal and written communication mode.	10	5	-

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Mapping Level	-	2.0	2.0	-	2.0	-	-	2.0	-	3.0	-	3.0	-	-	-	-

Course Guidelines:

Students are expected to pick a research-oriented activities or study of subjects outside current Body-of-Knowledge of Computer Science & Engineering at SDMCET. Prior to registration, a detailed plan of work should be submitted by the student to the committee appointed by DUGC for approval. The various rules to be followed are listed below:

1. This course is offered at 8th semester. Student from 5th and 6th semester can also register only if their CGPA is 9 and above. Duration may be spread across two semesters. But, physically this course will be reflected in the 8th semester scheme and grade sheet.
2. Guide for this course is must and will be chosen by students by interacting with faculty.

3. In consultation with Guide, Students will prepare the courses description and its outcomes, which he/she promises to accomplish and is to be finally approved by DUGC.
4. Grading is done by the Guide based on the seminar and the report submitted by the students; which are to be in line with the policy established by DUGC's Grade Committee from time to time. Other assessment tool may include demonstration, seminar, quiz, tests, Viva-Voce, publications etc. as the case is. If the Guide wishes, they can form their own examination body for evaluation with the approval of the committee on the behalf of DUGC.
5. Work worth of minimum of 26-30 Hrs spread across 10 to 12 weeks starting from the date of registration is to be ensured by the Guide.
6. Course content should belong to the Body-of-Knowledge (As per ACM, 2008 or its extensions).

Department of CSE will encourage the students to publish a paper in a reputed journal/conference or get certification through the use of well recognized MOOCS like NPTEL, Coursera, Swayam. Udacity etc…for their self-study and demonstrate highest level of ethics and professional practices.

21UCSL801 Major Project Phase – 2 (0-0-18) 9

Contact Hours: 234

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

Understand the domain through proper modeling and analysis using the state-of-art technology. Then apply relevant Software Engineering Principles to develop modular and robust applications through the use of Standards and tools. At the end build appropriate test cases, verification and validation techniques in order to make the project reliable and maintainable.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12) / PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Identify** the problem and **formulate** the problem statement.	1, 8, 2,12	-	-
CO-2	**Analyze** the problem scenario and **Design** the solutions to complex engineering problem using software engineering principles or appropriate research methodology.	3,5, 8, 13,12	11, 16	6, 7
CO-3	**Identify** and **Implement** a feasible	4,5, 8,	16	-

	solution using appropriate technology, tools, procedures and techniques.	14,12		
CO-4	**Verify** and **Validate** the proposed system for correctness and to demonstrate compliance with the design and hence the stated requirements/ research gap.	5, 8, 15,12	-	-
CO-5	**Prepare** the report and **communicate** effectively through presentation.	8, 9,10	-	-

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mapping Level	3.0	3.0	3.0	3.0	3.0	1.0	1.0	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	2.0

For details, refer the contents related to **Major Project – Phase 1** (**21UCSL702**).

21UCSL802 Internship – 2 3 Credits

Contact Hours: 4-6 weeks

Course Learning Objectives (CLOs): Internship provides an opportunity to get industry exposure to real time scenarios that include professional skill development programs and adhere to the professional standards.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12) / PSOs (13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Explore** the domain knowledge	1, 8, 2,12	-	-
CO-2	**Apply** the knowledge and skills in the professional career.	3,5, 8, 13,12	11, 16	6, 7
CO-3	**Prepare** a technical report	4,5, 8, 14,12	16	-
CO-4	**Demonstrate** the knowledge gained through presentation.	5, 8, 15,12	-	-

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mapping Level	3.0	3.0	3.0	3.0	3.0	1.0	1.0	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	2.0

Prerequisites: Knowledge of both theory and practical courses learnt in all the previous semesters and relevant value-added information.

Internship: The students are to undergo internship in Private industries/ R&D organizations/Centres of Excellence/Laboratories of Reputed Institutions/ Govt. & Semi Govt. organizations, PSUs, construction companies, entrepreneurial organizations, inter departments within the college etc. to get an exposure to the external world for a period of 4 weeks in the summer vacation after VI sem and before start of VII semester. The students are to prepare a report on the internship work carried out. The internal faculty shall monitor the student and award CIE marks. There is a SEE in which the student shall present his work before a panel of examiners consisting of HoD, Guide and one faculty member during VIII semester. The performance shall be communicated to the CoE office and the same shall reflect in the VIII semester grade card

CIE and SEE Evaluation (from 2024-25 batch)
Courses with LTP 3-0-0 and 4-0-0 or 2-2-0/3-2-0

Continuous Internal Evaluation (CIE):

- Two Internal Assessments and one Improvement test each of 20 marks and one hour duration.
- Two higher scores from three tests are taken representing 40 marks.
- Question Paper pattern for Internal Assessment: 3 questions of 10 marks each with maximum of two sub divisions. Q.3 is compulsory and one question to be answered from Q.1 and Q.2.
- Course Teacher Assessment (CTA): Minimum two components such as quiz, seminar, written assignment, any technical activity related to course each of 5marks. Total CTA marks-10
- CIE=40 (from tests)+10(from CTA) =50 marks

Semester End Examination (SEE):

- SEE is conducted for 100 marks with 3 hours duration. It is reduced to 50 marks.
- Question Paper pattern for SEE: Five units with built in choice. Each question with maximum of three sub divisions.
- Two questions are to be set from each unit with built in choice, for example Q1 or Q2 in unit –I, Q 3 or Q 4 in unit-II and so on.
- A total of 5 full questions to be answered choosing one full question from each unit. All five units are to be answered compulsorily.
- Each question is of 20 marks.
- The Question paper is to be set for duration of 3 hours both for 3 and 4 credits courses.

The Question paper is to be set for 100 marks for 3 and 4 credits courses.