CODE NO	SUBJECT NAME	Instruction periods per week					Max Marks		Credits
		Category	Lecture	Tutorial	Lab	Total	Sessional Marks	Semester End Marks	
CSE111	ENGLISH	HS	3	1	-	4	40	60	3
CSE112	ENGINEERING MATHEMATICS-I	HS	3	1	-	4	40	60	3
CSE113	ENGINEERING CHEMISTRY	BS	3	1	-	4	40	60	3
CSE114	PROFESSIONAL ETHICS &HUMAN VALUES	HS	2	1	-	3	100	-	2
CSE115	BASIC ELECTRONICS ENGINEERING	ES	3	1	-	4	40	60	3
CSE116	ENGINEERING CHEMISTRY LAB	BS	-	-	3	3	50	50	2
CSE117	PROGRAMMING WITH C-LAB	PC	-	2	3	5	50	50	3
CSEAC1	NCC/NSS/SPORTS	AC	-	-	3	3	-	-	0
Total			***14***	***7***	***9***	***30***	***360***	***340***	***19***

1st Year Semester II

CODE NO	SUBJECT NAME	Instruction periods per week					Max Marks		Credits
		Category	Lecture	Tutorial	Lab	Total	Sessional Marks	Semester End Marks	
CSE121	ENGNEERING MATHEMATICS-II	HS	3	1	-	4	40	60	3
CSE122	ENGINEERING PHYSICS	BS	3	1	-	4	40	60	3
CSE123	ENVIRNOMENTAL SCIENCES	HS	3	1	-	4	40	60	3
CSE124	ENGINEERING DRAWING	ES	1	-	3	4	40	60	3
CSE125	ELEMENTS OF ELECTRICAL ENGINEERING	ES	3	1	-	4	40	60	3
CSE126	ENGINEERING PHYSICS LAB	BS	-	-	3	3	50	50	2
CSE127	LANGUAGE LAB	HS	-	-	3	3	50	50	2
CSE128	OBJECT ORIENTED PROGRAMMING WITH C++ --LAB	PC	-	2	3	5	50	50	3
CSE129	WORKSHOP	ES	-	-	3	3	50	50	2
CSEAC2	NCC/NSS/SPORTS	AC	-	-	3	3	-	-	0
Total			***13***	***6***	***18***	***37***	***400***	***500***	***24***

BS: Basic Sciences; ES : Engineering Sciences; HS : Humanities and Social Sciences; PC : Professional Core;
PE : Professional Elective; OE : Open Elective; PW : Project Work; IT : Industrial Training; AC : Audit Course

CODE NO	SUBJECT NAME	Instruction periods per week					Max Marks		Credits
		Category	Lecture	Tutorial	Lab	Total	Sessional Marks	Semester End Marks	
CSE211	DATA STRUCTURES & ALGORITHMS	PC	4	1	-	5	40	60	4
CSE212	DIGTAL LOGIC DESIGN	ES	3	1	-	4	40	60	3
CSE213	DISCRETE MATHEMATICAL STRUCTURES	HS	4	1	-	5	40	60	4
CSE214	OBJECT ORIENTED PROGRAMMING WITH JAVA	PC	3	1	-	4	40	60	3
CSE215	PROBABILITY, STATISTICS & QUEUING THEORY	HS	4	1	-	5	40	60	4
CSE216	DATA STRUCTURES LAB	PC	-	-	3	3	50	50	2
CSE217	DIGITAL ELECTRONICS LAB	ES	-	-	3	3	50	50	2
CSE218	JAVA LAB	PC	-	-	3	3	50	50	2
Total			***18***	***5***	***9***	***32***	***350***	***450***	***24***

2nd Year Semester II

CODE NO	SUBJECT NAME	Instruction periods per week					Max Marks		Credits
		Category	Lecture	Tutorial	Lab	Total	Sessional Marks	Semester End Marks	
CSE221	DATA COMMUNICATIONS	PC	4	1	-	5	40	60	4
CSE222	MICROPROCESSORS AND INTERFACING	PC	3	1	-	4	40	60	3
CSE223	OPERATING SYSTEMS	PC	4	1	-	5	40	60	4
CSE224	COMPUTER ORGANIZATION	PC	4	1	-	5	40	60	4
CSE225	FORMAL LANGUAGES AND AUTOMETA THEORY	PC	4	1	-	5	40	60	4
CSE226	MICROPROCESSOR & INTERFACING LAB	PC	-	-	3	3	50	50	2
CSE227	OPERATING SYSTEMS LAB	PC	-	-	3	3	50	50	2
CSE228	HARDWARE LAB	PC	-	-	3	3	50	50	2
Total			***19***	***5***	***9***	***33***	***350***	***450***	***25***

3rd Year Semester I

CODE NO	SUBJECT NAME	Instruction periods per week					Max Marks		Credits
		Category	Lecture	Tutorial	Lab	Total	Sessional Marks	Semester End Marks	
CSE311	OPEN ELECTIVE I	OE	3	1	-	4	40	60	3
CSE312	DATA BASE MANAGEMENT SYSTEMS	PC	4	1	-	5	40	60	4
CSE313	COMPUTER GRAPHICS	PC	4	1	-	5	40	60	4
CSE314	COMPUTER NETWORKS	PC	4	1	-	5	40	60	4
CSE315	DESIGN & ANALYSIS OF ALGORITHMS	PC	4	1	-	5	40	60	4
CSE316	DATA BASE MANAGEMENT SYSTEMS LAB	PC	-	-	3	3	50	50	2
CSE317	COMPUTER NETWORK LAB	PC	-	-	3	3	50	50	2
CSE318	SOFT SKILLS LAB	HS	-	-	3	3	100	-	2
CSE319	QUANTATIVE& VERBAL APTITUDE I	HS	4	-	0	4	100	-	2
Total			***23***	***5***	***9***	***37***	***500***	***400***	***27***

3rd Year Semester II

CODE NO	SUBJECT NAME	Instruction periods per week					Max Marks		Credits
		Category	Lecture	Tutorial	Lab	Total	Sessional Marks	Semester End Marks	
CSE321	COMPILER DESIGN	PC	4	1	-	5	40	60	4
CSE322	SOFTWARE ENGINEERING	PC	4	1	-	5	40	60	4
CSE323	WEB TECHNOLOGIES	PC	4	1	-	5	40	60	4
CSE324	COMPUTER ARCHITECTURE	PC	4	1	-	5	40	60	4
CSE325	PROFESSIONAL ELECTIVE I	PE	4	1	-	5	40	60	4
CSE326	OPEN SOURCE TECHNOLOGIES LAB	PC	-	-	3	3	50	50	2
CSE327	SOFTWARE ENGINEERING LAB/MINI PROJECT LAB	PC	-	-	3	3	50	50	2
CSE328	QUANTATIVE & VERBAL APTITUDE II	HS	4	-	0	4	100	-	2
Total			***24***	***5***	***6***	***35***	***400***	***400***	***26***

4th Year Semester I

CODE NO	SUBJECT NAME	Instruction periods per week					Max Marks		Credits
		Category	Lecture	Tutorial	Lab	Total	Sessional Marks	Semester End Marks	
CSE411	OPEN ELECTIVE II	OE	3	1	-	4	40	60	3
CSE412	CRYPTOGRAPHY & NETWORK SECURITY	PC	3	1	-	4	40	60	3
CSE413	OBJECT ORIENDTED ANALYSIS & DESIGN	PC	4	1	-	5	40	60	4
CSE414	PROFESSIONAL ELECTIVE II	PE	4	1	-	5	40	60	4
CSE415	PROFESSIONAL ELECTIVE III	PE	4	1	-	5	40	60	4
CSE416	CRYPTOGRAPHY & NETWORK SECURITY LAB	PC	-	-	3	3	50	50	2
CSE417	INDUSTRIAL TRAINING & SEMINAR	IT	-	-	-	0	100	-	2
CSE418	PROJECT I	PW			6	6	100	0	4
Total			***18***	***5***	***9***	***32***	***450***	***350***	***26***

4th Year Semester II

CODE NO	SUBJECT NAME	Instruction periods per week					Max Marks		Credits
		Category	Lecture	Tutorial	Lab	Total	Sessional Marks	Semester End Marks	
CSE421	PROFESSIONAL ELECTIVE- IV	PE	4	1	-	5	40	60	4
CSE422	PROFESSIONAL ELECTIVE – V	PE	4	1	-	5	40	60	4
CSE423	PROJECT II	PW	-	-	12	12	100	100	8
CSE424	MOOC	OE	-	-	-	0	-	-	2
Total			8	2	12	22	180	220	18

Note: ***Total Credits:*** **189**

1. **Academic activities** I- Paper Presentation, Participation in Programming/coding contests.
2. **Academic activities II**- Certificate of participation related to Skill Development Programs/Advanced Topics
3. These courses can be completed from 2nd year to 4th year. It is student choice only.
4. Any one departmental elective, any one Open Elective and MOOC are Optional courses.
5. The total no of credits required to award B Tech Degree :180
6. Students having minimum 8 CGPA with no backlog till 3rdYr 2nd semester can take advance Departmental elective (IV or/and V) in 4thYr 1st Semester in place of OPEN ELECTIVE II having registered for OPEN ELECTIVE I in 3rdYr 1st Semester. Department will conduct extra classes as per the requirement . This is only for students having Internship order. Students should consult the department and decision of Head of the Department is final in this regard.

Semester	Elective Number	Subjects
3rd year 2nd Semester	PROFESSIONAL ELECTIVE-I CSE325	• CSE 325(A)Smart Systems Design & Programming • CSE 325(B)High Performance Computing • CSE325(C)Principles Of Programming Languages • CSE325(D)Advanced Data Structures • CSE325(E)Digital ImageProcessing • CSE325(F)No SQL Data Bases

4th year 1st Semester	PROFESSIONAL ELECTIVE-II CSE414	• CSE414(A)Mobile Computing • CSE414(B)Distributed Operating Systems • CSE414(C)Neural Networks & Deep Learning • CSE414(D)Human Computer Interaction • CSE414(E)Pattern Recognition
4th year 1st Semester	PROFESSIONAL ELECTIVE-III CSE415	• CSE415(A)Computer vision • CSE415(B)Embedded Systems • CSE415(C)Data Ware Housing & Data Mining • CSE415(D)Machine Learning • CSE415(E)Cyber Security
4th year 2nd Semester	PROFESSIONAL ELECTIVE-IV CSE421	• CSE421(A)Client Server Computing • CSE421(B)AugmentedReality • CSE421(C)Semantic Web • CSE421(D)Big Data Analytics • CSE421(E)Information Security & Auditing • CSE421(F)Social Network Analysis
4th year 2nd Semester	PROFESSIONAL ELECTIVE-V CSE422	• CSE422(A)Network Management • CSE422(B)Fuzzy Computing • CSE422(C)Wireless Sensor Networks • CSE422(D) Cloud Computing • CSE422(E) Computing Optimization
3rd year 1st Semester	OPEN ELECTIVE -1 CSE311	• CSE311(A)File Systems & Data Bases • CSE311(B)Computer Operating Systems • CSE311(C)Fundamentals of Computer Networks • CSE311(D)Concepts of Object Oriented Programming
4th year 1st Semester	OPEN ELECTIVE -II CSE411	• CSE411(A)Introduction to Soft Computing • CSE411(B)Web Design • CSE411(C)Cloud Computing • CSE411(D)Fundamentals of Digital Image Processing

CRYPTOGRAPHY AND NETWORK SECURITY	
CSE 412	**Credits : 3**
Instruction **:** 3 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:

- COMPUTR NETWORKS
- NUMBER THEORY
- PROBABILITY THEORY

Course Objectives:

The student will be able to:

- Learn OSI Security Architecture and Threats-Attacks & Attack Types-Services-Mechanisms in various layers
- Understand symmetric and asymmetric key cryptographic algorithms.
- Learn various key management algorithms and hashing techniques to achieve integrity.
- Acquire knowledge on application and network layers security.

Course Outcomes:

By the end of the course, the student will be able to:

1. Memorizing the concepts of Cryptographic systems.
2. Interpret the application of Cryptographic Techniques in Network Security.
3. Apply the algorithms to achieve the security goals of Confidentiality, Authentication and Integrity to a given application.
4. Determine the applications of authentication mechanisms.
5. Illustrate the techniques of Intrusion Detection systems and Firewalls.

Mapping of Course Outcomes with Program Outcomes:

Mapping		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	1	3	1	2	3	3	1	2	3	1	1	1		2
	2	3	3	3	2	1	2	1	1	2	1	2	1	3	2
	3	2	2	3	2	1	1	3	2	2	1		2	1	3
	4	2	2	3	3	2		2	1	2	1	3	2	1	3
	5	2	3	3	2	3	2	1	2	2	1	1	2	1	2

SYLLABUS

UNIT 1: INTRODUCTIONTO CRYPTOLOGY **14 periods**

Cryptography, Need for Security, Security Goals, Security Methodology, OSI Security Architecture: Threats-Attacks & Attack Types-Services-Mechanisms, Network Security Model: Plain Text-Cipher Text-Encryption-Decryption-Key, Key Range and Key Size, Classic Cryptography: Substitution-Transposition, Steganography. Basic Concept of Symmetric Cryptography, Algorithm Types and Modes, Principles of Public-Key Cryptography.

UNIT1 2:CONFIDENTIALITY **12 periods**

Symmetric Cryptography Techniques: Feistel Structure, DES-AES-RC4

Asymmetric Cryptography Techniques: Encryption/Decryption using RSA, Encryption/Decryption using Elliptic Curve Cryptography, Digital Envelope

UNIT 3: KEY MANAGEMENT AND INTEGRITY: **12 periods**

Key Distribution And Management: RSA Key Exchange, Diffie-Hellman Key Exchange, Digital Certificates (public key), Private Key Management.
Hashing: Cryptographic Hash Function Definition, Applications of Cryptographic Hash Functions, Message Authentication Functions, SHA-256

UNIT 4: AUTHENTICATION **10 periods**

Authentication Using Asymmetric Cryptography(Digital Signatures): Basic Idea of Digital Signatures, RSA Digital Signature Scheme, Digital Signature Standard,Kerberos.

UNIT 5: NETWORK SECURITY: **12 periods**

Application Layer: PGP, S/MIME, Transport Layer: TLS, SSL, Network Layer: IP Security Intrusion Detection Systems (IDS): Types of IDS Technologies, False Positives and Negatives, Intrusion Detection Techniques, Firewalls: Definition, Packet Filters, Circuit Level filters, Application Layer Filters

TEXTBOOK:

1) Cryptography and Network Security, Forouzan and Mukhopadhyay, 2nd edition, TMH.
2) Cryptography and Network Security: Principles and Practice, William Stallings, 5th edition, Pearson.

REFERENCES:

1) Cryptography and Network security, AtulKahate, Tata McGraw-Hill Pub company Ltd., New Delhi
2) Network Security Private Communication in a public world, Charlie Kaufman, Radia Perlman & Mike Speciner, Prentice Hall of India Private Ltd., New Delhi.
3) Network Security: The Complete Reference, Robert Bregga, Mark Rhodes-Ousley, Keith Strassberg, TMH.

OBJECT ORIENTED ANALYSIS AND DESIGN	
CSE 413	**Credits:4**
Instruction:4 Periods & 1 Tut/Week	Sessional marks:40
End Exam: 3 Periods	End Exam Marks:60

Prerequisites:

1. Basic Knowledge of Programming Fundamentals
2. Basic knowledge on procedural and object oriented programming.
3. Basic knowledge on problem solving.

Course Objectives:

- To learn the concept of Object Oriented Software Development Process
- To get acquainted with UML Diagrams
- To understand Object Oriented Analysis Processes
- To make them understand different problems in design along with learning how solve them using design patterns

Course Outcomes:

By the end of the course, the student will be able to

1. Outline the concepts & principles of Object Oriented Programming
2. Model UML diagrams according to object oriented Methodologies
3. Summarize on Object oriented Analysis & Identify the Classes
4. Structuring the basics of object Oriented Design along with patterns
5. Design Access Layer ,View layer & protocols for classes

CO – PO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	2	3	2	2				2				**2**	**1**
CO 2	1	2	3	1	1	1				1	1	1	**2**	**1**
CO 3	1	1	2	2			2			1	1	1	**2**	**1**
CO 4	1	1	2	2			1	1		1	1	1	**3**	**1**
CO 5	1	1	2	1		1	1	1		1	1	1	**2**	**2**

SYLLABUS

Unit I **10 periods**

Object Basics, Object oriented philosophy, objects, classes, attributes, object behaviour and methods, encapsulation and information hiding, class hierarchy, polymorphism, object relationships and associations, aggregations and object containment, case study, object identity, persistence.. Object oriented systems development life cycle: Software development process, building high quality software, use- case driven approach, reusability.

Unit II **12 periods**

Object Oriented Methodologies: Rumbaughetc all object modelling technique, Booch methodology, Jacobson et al methodologies, patterns, frameworks, the unified approach. Unified modelling language: Static and dynamic models, UML diagrams, UML class diagrams, use-case diagrams, UML dynamic modelling, packages, UML extensibility and UML meta model.

Unit III **16 periods**

Object Oriented Analysis Process: Business object analysis, use-case driven object oriented analysis, business process modelling, use-case model, developing effective documentation, case study. Classification: Classification theory, noun phrase approach, common class patterns approach, use-case driven approach, classes, responsibilities, and collaborators, naming classes.

Unit IV **12 periods**

Identifying Object Relationships, Attributes and Methods: Association, super-subclass relationships, a- part of relationships, case study, class responsibility, defining attributes for via net bank objects, object responsibility, defining methods for via net bank objects Design process and design axioms: Corollaries, design patterns.

Unit V **10 periods**

Designing Classes: UML object constraint languages, designing classes, class visibility, refining attributes for the via net bank objects, designing methods and protocols, designing methods for the via net bank objects, packages and managing classes. Designing access layer, case study.Designing view layer, macro level process.

Text Book :

Ali Bahrami, Object Oriented Systems Development using the Unified Modelling Language, McGraw Hill, Reprint 2009.

Reference Books:

1. Craig Larman : Applying UML and Patterns, Pearson Education, 2002
2. Grady Booch: Object-oriented analysis and design, Addison – Wesley, 1994.

Web resources:

:http://www.informit.com/store/product.aspx?isbn=020189551XAddison-Wesley 2007.

` https://www.tutorialspoint.com/object_oriented_analysis_design/

MOBILE COMPUTING(PROFESSIONAL ELECTIVE-II)	
CSE 414(A)	**Credits:4**
Instruction:4 Periods & 1 Tut/Week	Sessional marks:40
End Exam: 3 Periods	End Exam Marks:60

PREREQUISITE: Data Communication, Computer Network

Course Objectives:

- To make the student understand the concept of mobile computing terminology and basic services.
- To interpret the knowledge on working principle of wireless technology and applications of wireless protocols.
- To make the student aware of various architectures and technologies in mobile networking.
- To gain sufficient knowledge on various routing mechanisms.

COURSE OUTCOMES:

CO-1: Interpret the GSM architecture and its services.
CO-2: Analyze the various wireless applications and study technical feasibility of various mobile applications.
CO-3: Utilize the mobile network layer protocols and its functionalities.
CO-4: Analyze & develop any existing or new models of mobile environments for 3G networks.
CO-5: Evaluate and create the platform, protocols and related concepts of Ad hoc and Enterprise wireless networks

	POA	POB	POC	POD	POE	POF	POG	POH	POI	POJ	POK	POL	PSO1	PSO2
CO1	2	2	1	1	1					1		2		1
CO2	2	1	2	2	2							1		1
CO3	1	2	3											1
CO4	3	2	3	2	2					1				
CO5	2	2	2	3	1					2	2	2		2

SYLLABUS

UNIT-1 **12Periods**

Introduction: Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.

Global System for Mobile Communication(GSM): Services, System Architecture, Radio

Interfaces, Protocols, Localization, Calling, Handover, New Data Services, GPRS Architecture, GPRS Network Nodes.

UNIT-2 **12 Periods**

Medium Access Control (MAC) : Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), Wireless LAN/(IEEE 802.11) architecture, key IEEE802.11 a/b/c/d/e/g/i/n/T/ac/ standards.

Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML). Wireless Local Loop(WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.

UNIT-3 **12 Periods**

Mobile Network Layer : IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization using Soft computing techniques – ANT Bee colony, Support Vector Machine, Particle Swarm Optimization and Genetic Algorithm.

UNIT-4 **12 Periods**

Mobile Transport Layer : Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP.

Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA) and CDMA 2000, Quality of services in 3G.

UNIT-5 **12 Periods**

Mobile Ad hoc Networks (MANETs) : Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, etc. , Mobile Agents, Service Discovery ,case study using NS2 –traffic analysis using CBR and VBR

Wireless Enterprise Networks: Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols.

TEXTBOOKS:

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, Second Edition, 2009.
2. Raj Kamal, "Mobile Computing", Oxford University Press, 2007, ISBN: 0195686772

REFERENCE BOOKS:

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing, Technology Applications and Service Creation" Second Edition, McGraw Hill.
2. Martin Sauter, "From GSM to LTE-Advanced: An Introduction to Mobile Networksand Mobile Broadband," Second Edition, Wiley.

Web Resource:

1. https://onlinecourses.nptel.ac.in/noc18_cs09/preview
2. http://studentnet.cs.manchester.ac.uk/pgt/2014/WelcomeWeek/slides/MobComp I ntro2013-NPF.pdf

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY &&SCIENCES(Autonomous)

DEPARTMENT OF COMPUTER SCIENCE && ENGINEERING

B TECH COURSE PROPOSED SCHEME UNDER AUTONOMOUS SYSTEM 2015-16

PROFESSIONAL ELECTIVE – II

DISTRIBUTED OPERATING SYSTEMS	
CSE 414(B)	**Credits : 4**
Instruction **:** 4 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Distributed Operating Systems

Objectives:

- To provide an overview of the concepts of distributed operating systems and challenges that includes Architecture and Fundamental Models.
- To explore about various types of communication procedures and protocols in a distributed operating systems environment.
- To interpret the concept of communication between distributed objects and remote procedural calls.
- To analyse and understand the concepts of Distributed File system.
- To demonstrate the idea of Transactions and Replications in distributed operating system.

Outcomes:

By the end of the course student will be able to:

Co1: Analyze the system model, software layers of distributed operating systems and its challenges.

C02: Examine the inter-process communication, TCP stream communication procedures and protocols.

Co3: Evaluate the concepts of Remote procedural calls and communication among objects in distributed operating system.

Co 4: Apply the knowledge of peer-to-peer system, distributed mutual exclusion of distributed file system in real world scenario

Co5: Apply concurrency control, deadlock management techniques in distributed operating system for group communication.

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	**2**	**3**	**1**	**2**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**1**
	2	**1**	**3**	**2**	**2**	**1**	**1**	**0**	**1**	**0**	**0**	**1**	**1**	**1**	**1**
	3	**1**	**2**	**3**	**3**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**
	4	**3**	**1**	**1**	**3**	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**1**
	5	**3**	**1**	**1**	**3**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**1**

SYLLABUS

UNIT-I: 12 periods

Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges. System Models: Introduction, Architectural Models- Software Layers, System Architecture, Variations, Interface and Objects, Design Requirements for Distributed Architectures, Fundamental Models- Interaction Model, Failure Model, Security Model.

UNIT-II: 12 periods

Inter process Communication: Introduction, The API for the Internet Protocols- The Characteristics of Inter process communication, Sockets, UDP Datagram Communication, TCP Stream Communication; External Data Representation and Marshalling; Client Server Communication; Group Communication- IP Multicast- an implementation of group communication, Reliability and Ordering of Multicast.

UNIT-III: 10 periods

Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects- Object Model, Distributed Object Modal, Design Issues for RMI, Implementation of RMI, Distributed Garbage Collection; Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI

UNIT-IV: 12 periods

Distributed File Systems: Introduction, File Service Architecture; Peer-to-Peer Systems: Introduction, Napster and its Legacy, Peer-to-Peer Middleware, Routing Overlays. Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication.

UNIT-V: 12 periods

Transactions & Replications: Introduction, System Model and Group Communication, Concurrency Control in Distributed Transactions, Distributed Dead Locks, Transaction Recovery; Replication-Introduction, Passive (Primary) Replication, Active Replication.

Text Books:

1. Ajay D Kshemkalyani, MukeshSighal, “Distributed Computing, Principles, Algorithms and Systems”, Cambridge.
2. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems- Concepts and Design”, Fourth Edition, Pearson Publication.

Reference Books :

1. Advanced Concepts in Operating Systems, Makes Singhal and NiranjanG.Shivaratna, Tata McGraw Hill Edition.

Web Resources:

1. https://www.coursera.org/learn/distributed-programming-in-java
2. https://www.edx.org/course/javacheng-xu-she-ji-java-programming-pekingx-04830340x
3. https://www.coursera.org/courses?languages=en&query=java

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY &&SCIENCES(Autonomous)

DEPARTMENT OF COMPUTER SCIENCE && ENGINEERING

PROFESSIONAL ELECTIVE – II

NEURAL NETWORKS & DEEP LEARNING	
CSE 414 (C)	**Credits : 3**
Instruction **:** 3 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:

Linear Algebra, Probability Theory, Algorithms.

Course Objectives:

- Introduce neural networks and different network architectures.
- Provide applications oriented knowledge for neural networks
- Provide knowledge on deep neural networks

Course Outcomes: By the end of the course, the student will be able to

1.Examine different neural network architectures.

2.Describe the underlying mathematics in neural networks and deep learning algorithms.

3.Select an appropriate neural network approach for a given task.

4.Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.

5.Implement neural networks & deep learning algorithms and solve real-world problems.

Mapping of Course Outcomes with Program Outcomes:

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO-1	PSO-2
CO-1	1	1	1	1									1	1
CO-2	3	2	2	1									1	2
CO-3	2	2	2	2								1	1	2
CO-4	1	2	2	3								1	1	2
CO-5	1	2	2	2	3							1	1	2

SYLLABUS

Introduction to soft Computing

UNIT-I: 12 periods

Introduction to neural networks: Human brain and models of a neuron, Network architectures.

Learning processes: Error correcting learning, memory-based learning, Hebbian learning, competitive learning, Boltzman learning;

UNIT-II: 12 periods

Single-layer perceptrons: Unconstrained optimization, LMS algorithm, learning curves, perceptrons, convergence theorem, limitations of single-layer perceptrons;

Multi-layer perceptrons: Back-propagation algorithm, XOR problem, feature detection, accelerated convergence of back-propagation algorithm, limitations;

Case study: Feed forward Networks for Handwritten Digit Recognition using keras with theano

UNIT-III: **10 periods**

Convolutional networks: Convolution operation, motivation, pooling, convolution and pooling as an infinitely strong prior, variants of basic convolution function, efficient convolution algorithms

Recurrent and recursive networks: Recurrent neural networks, bidirectional RNNs, Encoder-decoder sequence-sequence architectures, deep recurrent networks, LSTMs, Autoencoders

Case study: Image Classification with Convolutional Networks using keras with theano

UNIT-IV: **12 periods**

Hopfield nets and Boltzmann machines : Boltzmann machines, restricted boltzmann machines, deep melief networks, deep boltzmann machines

UNIT-V: **12 periods**

Current areas of research and recent applications of deep neural nets – GANs, GRUs

Text Books:

1. Simon Haykin "*Neural Networks, A comprehensive Foundation*", Second Edition, Pearson Education.

2. Ian Goodfellow, YoshuaBengio, Aaron Courville " Deep Learning", MIT Press,2016

Reference Books :

1. Simon Haykin*,"Neural Networks and Learning Machines",Third Edition,* Pearson Education

Web Resources:

1. Coursera - Neural networks and deep learning
2. Stanford CS231n – Convolutional Neural networks for visual recognition
3. Stanford CS224n – Natural Language Processing with deep learning
4. Github - https://github.com/search?q=topic%3Aneural-network&type=Repositories

PROFESSIONAL ELECTIVE – I (for CSE Students)

HUMAN COMOPUTER INTERACTION	
CSE 414 (D)	**Credits : 4**
Instruction **:** 4 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:

Student should have an idea about User Interface Design and Programming

Course Objectives:

The main objective is to get student to think constructively and analytically about how to design and evaluate interactive technologies.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Make use of four pillars of design, participatory design, scenario development of design processes that supports social, ethical and legal issues.
2.	Apply an interactive design process and universal design principles to design HCI systems.
3.	Analyze Importance of response time, attitudes and user productivity related to quality of service on Display Design, Web Page Design, Window Design HCI Systems.
4.	Distinguish the online user documentation from paper documentation along with online communities' assistance.
5.	Compare searching and visualization methodologies in Textual Documents, Database Querying, and Multimedia Documents.

Mapping of Course Outcomes with Program Outcomes:

Mapping		1	2	3	4	5	6	7	8	9	10	11	12	Pso1	Pso2
CO	1	3					1	1	1	2	2	1	1	1	
	2	3					1	1	1	2	2		1		
	3	2	3				1	1	1	2	2	1	1	1	
	4	2	3				1	1					1		
	5	1	2	2	3			1					1		

SYLLABUS

UNIT I: **12 -14 Hours**

Introduction: Usability of Interactive Systems- introduction, usability goals and measures, usability motivations, universal usability, goals for our profession.

Managing Design Processes: Introduction, Organizational design to support usability, Four pillars of design, development methodologies, Ethnographic observation, Participatory design, Scenario Development, Social impact statement for early design review, legal issues, Usability Testing and Laboratories.

UNIT II: **16-18 Hours**

Menu Selection, Form Fill-In and Dialog Boxes: Introduction, Task- Related Menu Organization, Single menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data entry with Menus: Form Fill-in, dialog Boxes, and alternatives, Audio Menus and menus for Small Displays.

Command and Natural Languages: Introduction, Command organization Functionality, Strategies and Structure, Naming and Abbreviations, Natural Language in Computing

Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory Interfaces, Displays- Small and large.

UNIT III: **14-16 Hours**

Quality of Service: Introduction, Models of Response-Time impacts, Expectations and attitudes, User Productivity, Variability in Response Time, Frustrating Experiences

Balancing Function and Fashion: Introduction, Error Messages, Non anthropomorphic Design, Display Design, Web Page Design, Window Design, Color.

UNIT IV: **7-9 Hours**

User Documentation and Online Help: Introduction, Online Vs Paper Documentation, Reading from paper Vs from Displays, Shaping the content of the Documentation, Accessing the Documentation, Online tutorials and animated documentation, Online communities for User Assistance, The Development Process.

UNIT V: **7-9 Hours**

Information Search: Introduction, Searching in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Searching Interfaces Information Visualization: Introduction, Data Type by Task Taxonomy, Challenges for Information Visualization

Text Books:

1. Designing the User Interface, Strategies for Effective Human Computer Interaction, 5ed, Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven M Jacobs, Pearson
2. The Essential guide to user interface design,2/e, Wilbert O Galitz, Wiley DreamaTech.

Reference Books :

1. Human Computer, Interaction Dan R.Olsan, Cengage,2010.
2. Designing the user interface. 4/e, Ben Shneidermann , PEA.
3. User Interface Design, SorenLauesen ,PEA.
4. Interaction Design PRECE, ROGERS, SHARPS, Wiley.

Web Resources:

- https://onlinecourses.nptel.ac.in/noc18_cs23/preview

PROFESSIONAL ELECTIVE – II

PATTERN RECOGNITION	
CSE 414(E)	**Credits : 3**
Instruction **:** 3 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:
Basic Knowledge of statistics and probability theory.

Course Objectives:
- To make the students aware of pattern recognition techniques,
- To enable the students to develop pattern classification methodologies.

Course Outcomes
By the end of the course, the student will be able to:
1. Apply pattern recognition techniques, simple pattern classifiers and discriminate functions for a normal density.
2. Analyze the statistical bases of the classification theory
3. Analyze segmentation using non parametric techniques and linear discriminate functions.
4. Evaluate multi layer neural networks components, operations and algorithms.
5. Apply stochastic methods and non metric methods on real world problems.

Mapping of Course Outcomes with Program Outcomes:

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2		1	1						1	1		1
CO2	2	3	1	2	1								1	2
CO3		2		2	2				1		1			3
CO4	2	2	1	1	1				2		1	1		3
CO5	3	3	2	3	3				3		3		1	3

SYLLABUS

UNIT-I: **10 periods**
Introduction:
Pattern recognition systems, the design cycle, Learning and adaptation;

Bayesian Decision Theory:
Introduction, Minimum error rate classification, Classifiers, Discriminant functions, and Decision surfaces, The normal density, Discriminant functions for the normal density, Example.

UNIT-II: **12 periods**
Maximum-Likelihood and Bayesian Parameter Estimation:
Maximum-Likelihood estimation, Bayesian estimation, Bayesian parameter estimation (Gaussian case), Bayesian parameter estimation, Problems of dimensionality, Component analysis and Discriminants.

UNIT-III: **12 periods**
Non-parametric Techniques:
Density estimation, Parzen windows, *k*-nearest neighbor estimation, The nearest neighbor rule;

Linear discriminant functions:

Linear discriminant functions and decision surfaces, Generalized linear discriminant functions, The two-category linearly separable case, The descent algorithm, Minimum squared-error procedure with example, The Ho-Kashyap procedures.

UNIT-IV: **12 periods**

Multilayer neural networks:

Introduction, Feed-forward operation and classification, Back propagation algorithm, Error surfaces, Representation at the hidden layer.

UNIT-V: **12 periods**

Stochastic methods:

Introduction, Stochastic search, Boltzmann learning, Evolutionary methods, Genetic programming;

Non-metric methods:

Introduction, decision tree, CART, ID3, C4.5.

Text Books:

1. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification (2nd ed) John Wiley & Sons, 2006.

Reference Books :

1. Theodoridis and K. Koutroumbas, Pattern Recogniton , 4th edition, Academic Publishers, 2009;
2. R. Shighal, Pattern Recognition: Techniques and Applications, Oxford University Press, 1st edition, 2006.

Web Resources:

1. http://nptel.ac.in/courses/117108048/

PROFESSIONAL ELECTIVE – I (for CSE Students)

COMPUTER VISION	
CSE 415(A)	**Credits : 3**
Instruction **:** 4 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3Hours	End Exam Marks : 60

Prerequisites:
Basic Knowledge of computer graphics and image processing.

Course Objectives:
- To understand light and shading effects
- To understand filtering and texture techniques
- To understand the use of clustering techniques & models for segmentation
- To understand fitting techniques

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

By the end of the course, the student will be able to:	
1.	Summarize the effect of radiometry in space and surface, Interpret local and global shading models and its effects.
2.	Identify appropriate linear filter mechanisms to enhance texture images
3.	Make use of clustering mechanisms in order to perform image segmentation.
4.	Apply fitting mechanisms on lines, curves and different shapes for image segmentation.
5.	Classify the images fitting using Class Histograms, Feature Selection, Neural Networks, Support Vector Machines.

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	**2**	**3**										**1**		
	2	**1**	**1**	**2**	**2**								**1**		
	3	**2**	**3**										**1**		**1**
	4	**1**	**1**	**2**							**1**		**1**		**1**
	5	**1**	**1**	**1**	**2**						**1**		**1**		**1**

SYLLABUS

UNIT-1 **12 PERIODS**

RADIOMETRY-MEASURING LIGHT: Light in Space, Light at Surfaces, Important Special Cases.

SOURCES, SHADOWS, AND SHADING: Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Inter reflections: Global Shading Models.

UNIT-2 **12 PERIODS**

LINEAR FILTERS: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, Technique: Normalized Correlation and Finding Patterns, Technique: Scale and Image Pyramids.

EDGE DETECTION: Noise, Estimating Derivatives, Detecting Edges.

TEXTURE: Representing Texture, Analysis using Oriented Pyramids, Application: Synthesizing Textures for Rendering, Shape for Texture for Planes.

UNIT-3 **12 PERIODS**

SEGMENTATION BY CLUSTERING: What is Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering.

UNIT-4 **12 PERIODS**

SEGMENTATION BY FITTING A MODEL: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as Probabilistic Inference Problem, Robustness, Example: Using RANSAC to Fit Fundamental Matrices, Missing Data Problems, the EM Algorithm.

UNIT-5 **12 PERIODS**

FINDING TEMPLATES USING CLASSIFIERS: Method for Building Classifiers, Building Classifiers from Class Histograms, Feature Selection, Neural Networks, the Support Vector Machine.

Text Books:

TEXT BOOK:

1. David A.Forsyth, Jean Ponce, Computer Vision-A Modern Approach, PHI, 2003.

REFERENCES:

1. Geometric Computing With Clifford Algebras: Theoretical Foundations and Applications in Computer Vision and Robotics , Springer; 1/ e,2001 by Sommer.
2. Digital Image Processing and Computer Vision, 1/e, by Sonka.
3. Computer Vision and Applications: Concise Edition(With CD) by Jack, Academy Press, 2000.

Professional Elective III

CSE415(B)Embedded Systems	
CSE 415(B)	**Credits :**
Instruction **:** 3 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:

Basic Knowledge of Programming Fundamentals
Knowledge of Programming Languages (such as C, C++)

Course Objectives:

1.Find the basic components required to build an embedded system.
2.Select an appropriate software architecture to build an embedded system..
3.Design embedded software using RTOS.
4.Build embedded software using different software tools.
5.Debug embedded software using different software and hardware tools.

CO-PO mapping

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO-1	PSO-2
CO-1	3	3	1										1	1
CO-2	1	2	3										1	2
CO-3	1	2	3									1	1	1
CO-4	1	2	2	3	3							1	1	2
CO-5	1	1	2	3	3							1	1	2

SYLLABUS

UNIT I **12 PERIODS**

Introduction to embedded systems hardware needs, timing diagrams, memories (RAM, ROM, EPROM). Tristate devices, Buses, PLD's, Built-ins on the microprocessor. Interrupts basics, ISR, Context saving, shared data problem. . Atomic and critical section. (8 Periods)

UNIT II 12 PERIODS

Survey of software architectures, Round Robin, Function queue scheduling architecture, Use of real time operating system. RTOS, Tasks , Scheduler, Shared data reentrancy, priority inversion, mutex binary semaphore and counting semaphore. (8 Periods)

UNIT III 12 PERIODS

Inter task communication, message queue, mailboxes and pipes, timer functions, events. Interrupt routines in an RTOS environment. Embedded system software design using an RTOS. Hard real time and soft real time system principles, Task division, need of interrupt routines, Interrupt latency Introduction to Device Drivers. (10 Periods)

UNIT IV 12 PERIODS

Embedded Software development tools. Host and target systems, cross compilers, linkers, locators for embedded systems. Getting embedded software in to the target system. (9 Periods)

UNIT V 12 PERIODS

Debugging techniques. Testing on host machine, ,Instruction set emulators, logic analysers. In-circuit emulators and monitors.

Case Study

DEVELOPING EMBEDDED C APPLICATIONS THROUGH KEIL SOFTWARE, Embedded PROGRAMMING IN C++, java (10 Periods)

Text Books:

1. David A. Simon, An Embedded Software Primer, Pearson Education, Inc.,1999
2. Raj Kamal, Embedded Systems, Architecture, Programming and Design, TMH, 2003

Reference Books:

1. Sriram V Iyer and Pankaj Gupta, Embedded Real Time

Systems programming, TMH, 2004.

2. Embedded C by M J Pont.

PROFESSIONAL ELECTIVE III

DATA WARE HOUSING & DATA MINING	
CSE415(C)	Credits : 4
Instruction : 4 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:

Before proceeding with this course, Student should have an understanding of the basic database concepts such as schema, ER model, Structured Query language and a basic knowledge of Data Warehousing concepts

Course Objectives:

1. The basics and challenges issues in Data Mining
2. The concepts of data warehouse and data mining
3. The tools and techniques used for Knowledge Discovery in Databases
4. The Potential and Current research issues in DataMining

Course Outcomes

By the end of the course, the student will be able to:

1. Extend the basics, challenging issues in Data Mining data warehousing and OLTP technologies.
2. Focus on data pre-processing approaches and data mining primitives, language, system architecture.
3. Analyze data generalization, summarization-based characterization; attribute relevance analysis in concept description. Analyze association rule mining in large databases.
4. Illustrate classification by using decision tree induction, Bayesian , back propagation and prediction methods.
5. Interpret categorization of major clustering methods.

Mapping		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	2	2		1									1	1
	2	2	3	2	2	1	1		1	2	1	2	1	2	1
	3	2	3	2	2	2	2	1	1	1	1	2	2	3	
	4	2	3	1	1	1	1	1	1	2	2	2	3	3	1
	5	2	3	1	1	2	2	1	1	1	1	1	3	3	1

SYLLABUS

UNIT-1: **14 Periods**

Introduction to Data Mining: Motivation and importance, what is Data Mining, Relational Databases, Data Warehouses, Transactional Databases, Advanced Database Systems and Advanced Database Applications, Data Mining Functionalities, Interestingness of a pattern Classification of Data Mining Systems, Major issues in Data Mining.

Data Warehouse and OLAP Technology for Data Mining: What is a Data Warehouse? Multi-Dimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Development of Data Cube Technology, Data Warehousing to Data Mining.

UNIT-II: **10 Periods**

Data Pre-processing: Why Pre-process the Data? Data Cleaning, Data Integration and Transformation Data Reduction, Discretization and Concept Hierarchy Generation

Data Mining Primitives, Languages and system Architectures, Data Mining Primitives: Data Mining Task, A Data Mining query language, Designing Graphical User Interfaces Based on a Data Mining Query language, Architectures of Data Mining Systems.

UNIT-III: 14 Periods

Concept Description: Characterization and comparison, what is Concept Description? Data Generalization and summarization-based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between different Classes, Mining Descriptive Statistical Measures in large Databases.

Mining Association rule in large Databases: Association Rule Mining, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining

UNIT-IV: 14 Periods

Classification and prediction: Concepts and Issues regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back-propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods like k-Nearest Neighbor Classifiers, Case- Based Reasoning, Generic Algorithms, Rough Set Approach, Fuzzy Set Approaches, Prediction, Classifier Accuracy

UNIT-V: 12 Periods

Cluster Analysis: What is Cluster Analysis? Types of Data in Cluster Analysis, a Categorization of Major Clustering Methods

Text Book:

1. Data Mining Concepts and Techniques, Jiawei Han and MichelineKamber, Morgan Kaufman Publications

Reference Books:

1. Introduction to Data Mining, Adriaan, Addison Wesley Publication
2. Data Mining Techniques, A.K.Pujari, University Press

Web Resources:

1. http://nptel.ac.in/syllabus/106106046/
2. http://nptel.ac.in/courses/106106093/35

Machine Learning	
CSE 415(D)	**Credits : 4**
Instruction **:** 4 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:

Concept of statistics and probability

Course Objectives:

1. Students will understand the basic concepts of Machine Learning, in particular focusing on the core concepts of supervised and unsupervised learning.
2. Students will learn the algorithms which underpin many popular Machine Learning techniques,
3. Students can acquire the knowledge in developing an understanding of the theoretical relationships between these algorithms

Course Outcomes:By the end of the course, the student will be able to:

1. Demonstrate well posed machine learning problems and examine Find-s, version space and candidate elimination algorithm.
2. Construct and analyze the problems and issues of decision tree learning algorithm.
3. Apply Bayes theorem, concept learning, maximum likelihood, least squared error hypothesis for classification of text data.
4. Illustrate neural network representation, problems of neural networks and back propagation algorithm
5. Determine nearest neighborhood learning and locally weighted regression. Illustrate optimization problems using genetic algorithms.

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	1	2	1		1				1	1					1
	2	2	2	3	3		1			2	1	1	1		
	3	2	2	1	2		2	1	1	1	2		2	3	1
	4	2	3	1	1	2	1	2	1	1	1	1	1	3	1
	5	2	3	1	1	2	2	1	1	1	1	1	2	3	1

Syllabus

UNIT-I:

Introduction: **12 PERIODS**

Well-posed learning problems, Types of machine learning, designing a learning system, Perspectives and issues in machine learning. A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Inductive Bias

UNIT II:

Decision Tree learning: 12 PERIODS

Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis Space search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in decision tree learning

UNIT III:

Bayesian learning 12 PERIODS

Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Bayes optimal classifier, Naïve bayes classifier, An example learning to classify text,

UNIT IV:

Artificial Neural Networks 12 PERIODS

Introduction, neural network representation, problems for neural network learning, perceptron , Multilayer networks and back propagation algorithm

UNIT V: 12 PERIODS

Instance based Learning

earest neighborhood learning, Locally weighted regression

Genetic Algorithm

Motivation ,Representing Hypothesis, Genetic operators, Fitness function and selection ,An Illustrative Example

TEXT BOOK:

1. Machine Learning ,Tom M. Mitchell,MGH,1997

REFERENCE BOOK:

1. Machine Learning, An Algorithmic Perspective, Stephen Marsland, Taylor&Francis (CRC)
2. Introduction to Machine Learning, EthemAlpaydin, PHI,2004.

PROFESSIONAL ELECTIVE – III

CYBER SECURITY	
CSE415(E)	**Credits : 4**
Instruction **:** 4 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:
Basic Knowledge of Data Communications, Computer Networks
Knowledge of Operating Systems Windows, Linux and Programming Languages (C, C++)

Course Objectives:

- Introducing Cyber Security Concepts
- Giving basic exposure about Cyber Crimes
- Explaining tools used in Cyber Crimes
- Explaining Cyber Law present in the system.

Course Outcomes: By the end of the course, the student will be able to:

1. Explain about vulnerability scanning approaches and describe the functionality of different types of scanning and service tools.
2. Comprehend about networking layers and summarize the defense methodologies and its relevant tools functionality.
3. Describe and inspect web vulnerabilities through Zed Attack Proxy, Sqlmap. DVWA, Webgoat and password cracking mechanisms.
4. Comprehend the cybercrime scenario and recognize the appropriate cyber law.
5. Demonstrate the cybercrime scenario and solve the crime through investigation by applying ethical hacking mechanisms.

Mapping of Course Outcomes with Program Outcomes:

Mapping		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	1	2										1		
	2	1	2										1		
	3	1	2	3									1		
	4		2										1		
	5	1	1	2	3						1		1		

SYLLABUS

UNIT-I: Systems Vulnerability Scanning 12 periods

Overview of vulnerability scanning, Open Port / Service Identification, Banner /Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet

UNIT-II: Network Defense tools 12 periods

Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless VsStateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System

UNIT-III: Web Application Tools 10 periods

Scanning for web vulnerabilities tools: Nikto, W3af, HTTP utilities - Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap. DVWA, Webgoat, Password Cracking and Brute-Force Tools – John the Ripper, L0htcrack, Pwdump, HTC-Hydra

UNIT-IV: Introduction to Cyber Crime and law 12 periods

Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Computer Language, Network Language, Realms of the Cyber world, A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000.

UNIT-V: Introduction to Cyber Crime Investigation and Ethical Hacking 12 periods

Firewalls and Packet Filters, password Cracking, Key loggers and Spyware, Virus and Warms, Trojan and backdoors, Stegnography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks

Text Books:

1.Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication McGraw Hill. 2.Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and SunitBelpure, Publication Wiley

Reference Books :

1. The Complete Reference Network Security By Robert Bragg,Mark Rhodes-Ousley,KeithStrassberg, 1st Edition,McGraw Hill India (2004) Publication

Web Resources:

1) https://www.coursera.org/specializations/cyber-security

2) https://computersecurity.stanford.edu/

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CRYPTOGRAPHY & NETWORK SECURITY LAB	
CSE 416	**Credits : 2**
Instruction : 3 Hrlab/Week	Sessional Marks : 50
End Exam : 3 Hours	End Exam Marks : 50

Prerequisites:
Basic knowledge of Computer Networks
Exposure to Problem solving techniques and programming skills

Course Objectives:
- Introducing different tools related to Network Security.
- Introducing how to implement cryptographic algorithms in C/C++/Java.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Demonstrate the process of capturing Network traffic using tools(Ethereal,Wireshark,Tcpdump)
2.	Implement Cryptographic algorithms in C/C++/Java
3.	Build Secure communication channel for web communication.
4	Use tools nmap and IPtables for network security.

Mapping of course outcomes with program outcomes:

Mapping		PO												PS O	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1		1	1	2	3			2	3			1	1	1
	2	1	2	3	3					2	3		1	1	2
	3		2	3						2	3		1	1	1
	4		2	2	3	3				2	3		1	1	2

SYLLABUS

LIST OF EXPERIMENTS:

1. Working with Sniffers for monitoring network communication using a)Ethereal b)Wireshark c) Snort d) tcpdump
2. Implementation and Performance evaluation of various cryptographic algorithms in C/C++ a)DES b)RSA
3. Using IP TABLES on Linux and setting the filtering rules
4. Using open SSL for web server - browser communication
5. Configuring S/MIME for e-mail communication
6. Understanding the buffer overflow and format string attacks
7. Using NMAP for ports monitoring
8. Secure Socket programming.

Case studies:

9. Study of GNU PGP.
10. Study Intrusion Detection Systems and Honey pots.

Text Books :

1)The Complete Reference Network Security By Robert Bragg,Mark Rhodes-Ousley,KeithStrassberg, 1st Edition,McGraw Hill India (2004)Publication

2) The Unofficial Guide to Ethical Hacking by byAnkitFadia ,Second edition(2006),Laxmi Publications.

3) Network Security Tools Writing, Hacking, and Modifying Security Tools by NiteshDhanjani, Justin Clarke, 2013 Edition, Publisher: O'Reilly Media.

4) Linux and UNIX Security Portable Reference Book by Nitesh Dhanjani,1stEdition,McGraw-Hill.

Reference Books:

1)Network Security Tools Writing, Hacking, and Modifying Security Tools By NiteshDhanjani, Justin Clarke,2nd Edition, Publisher: O'Reilly Media

Web Resources:

1) https://www.udemy.com/courses/it-and-software/network-and-security/
2) https://online.stanford.edu/course/network-security

CLOUD COMPUTING	
CSE 411(C)	**Credits: 3**
Instruction: 3Periods & 1Tut/ Week	Sessional Marks : 40
End Exam: 3Hours	End Exam Marks : 60

Prerequisites:

To Undertake this course student must have basic understanding of Data Communications and Networking Technologies.

Prior knowledge of computing and about the software systems.

Student must be familiar with the concept of , parallel and distributed programming

Course Objectives:

- To make students understand with the fundamentals and essentials of Cloud Computing.
- To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
- To enable students exploring some important cloud computing driven commercial systems such as GoogleApps, Microsoft Azure and Amazon Web Services and other businesses cloud applications

Course outcomes:

By the end of the course, the student will be able to:	
1.	To be familiar with the basics, challenges, need of cloud computing.
2.	Able to identify infrastructure of cloud.
3.	Describe different cloud services.
4.	Analyzing different cloud data storage and cloud security options.
5.	To analyze the need to migrate to the cloud and how cloud computing might evolve.

Mapping of course outcomes with program outcomes:

Mapping		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	2	2			1				2	2	2	2		
	2	3	3	1		2				2	2	3	2		
	3	3	3	2		2				2	2	3	2		
	4	3	3	2		2				2	2	3	2		
	5	2	2	2		1				2	2	3	3		

SYLLABUS

Unit – I : **10 Periods**

Cloud Computing Basics:

Cloud Computing Overview, Classify and describe the architecture and taxonomy of parallel and distributed computing, including shared and distributed memory, and data and task parallel computing. Explain and contrast the role of Cloud computing within this space. Intranets and the Cloud, FirstMovers in the Cloud. The Business Case for Going to the Cloud - Cloud Computing Services introduction

Unit–II: **10 Periods**

Hardware and Infrastructure–Clients:

Mobile, Thick, Thin, Security:- Data Leakage, Offloading work, Logging, Forensics, Compliance VPNs, Key management ,Network- four different levels : Basic Public Internet, The Accelerated Internet, Optimized Internet Overlay Site-to-Site VPN, Services : - identify, integration, mapping, payment, search. Accessing the Cloud –Platforms.

Unit- III: **10Periods**

Cloud Services :

Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS),Software plus services - Overview, Cloud computing applications and business case for going to the cloud, Infrastructure as a Service--Amazon EC2, Platform as a Service—RightScale, Salesforce.com ,Software as a Service--Google App Engine and Salesforce , --Microsoft's take on SaaS is slightly different with their Software plus Services (sometimes they shorten it to S+S) Software plus Services

Unit – IV : **12 Periods**

Cloud Storage and data storage security:

what is cloud storage? uses of cloud storage, Types of cloud storage, things looked for cloud storage, infrastructure, data types used in cloud computing, Data security challenges, VPN-Virtual Private Network ,FADE – File assured deletion ,TPA – Third Party Auditing. Cloud Security – need for security and privacy in cloud computing, Security and privacy issues

Unit-V: **12 Periods**

Local Clouds,ThinClients,Thick clients:

Types of Virtualizations,Virtualization in Your Organization, Server Solutions, Thin Clients, Migrating to the Cloud - Cloud Services for Individuals, Cloud Services Aimed at the Mid-Market, Enterprise-Class Cloud Offerings, Migration, Best Practices and the Future of Cloud Computing - Analyze Your Service, Best Practices, How Cloud Computing Might Evolve.

Text Book:

1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter. "*Cloud Computing-A Practical Approach", 1stEdition,* McGrawHill.

Reference Books:

1. Derrick Rountree and lleanaCastrillo, "*The Basics of Cloud Computing* ",
2. L. Wang, R. Ranjan, J. Chen, and B. Benatallah, "*Cloud Computing: Methodology, Systems, and Applications*", CRC Press, Boca Raton, FL,USA, ISBN: 9781439856413, October 2011.
3. Buyya R., Broberg J., Goscinski A., "*Cloud Computing: Principles and Paradigms*", John Wiley & Sons Inc., ISBN: 978-0-470-88799-8, 2011.

Web Resources:

1. http://nptel.ac.in/courses/106106129/28
2. http://www.guru99.com/cloud-computing-for-beginners.html
3. http://www.pritee.org/index.php/study-material/cloud-computing
4. https://cloudacademy.com/
5. https://www.youtube.com/watch?v=LICA-ILkO4w&list=PLmG5jF3D4ahDQ_4I9yPcRdI7q6t5RAeNN
6. https://www.youtube.com/watch?v=Vw7UxHlyDyA&list=PLFd87qVsaLhOkTLvfp6MC94iFa_1c9wrU
7. https://www.youtube.com/watch?v=LICA-ILkO4w

FUNDAMENTALS OF DIGITAL IMAGE PROCESSING	
CSE 411(D)	**Credits : 3**
Instruction : 3 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	Ena Exam Marks : 60

Prerequisites:

Knowledge of linear algebra, basic probability and statistics, introductory knowledge of basic programming language, MATLAB/C are preferred.

Course Objectives:

- Overview of digital image processing field;
- Image transform used in digital image processing.
- Image enhancement techniques used in digital image processing.
- Image restoration techniques and methods used in digital image processing.
- Image compression and Segmentation used in digital image processing

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Demonstrated understanding of the basic concepts of two-dimensional signal acquisition, sampling, and quantization
2.	Demonstrated understanding of spatial filtering techniques, including linear and nonlinear methods
3.	Demonstrated understanding of 2D Fourier transform concepts, including the 2D DFT and FFT, and their use in frequency domain filtering.
4.	Demonstrated understanding of the fundamental image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection
5.	Demonstrated programming skills in digital image processing related problems

Mapping of course outcomes with program outcomes:

Mapping		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	3	3	2	2	2	2	1		2		1	1	1	1
	2	3	2	1	1		1	1		1		1		1	
	3	1	2	3	1		2	1		1		1		1	1
	4	1	3	3				1				1	1	1	
	5	1	1	3	3			1	2			1	1	1	1

SYLLABUS

UNIT-I :

Introduction : **12 periods**

Digital Image Processing and Applications – Image Representation and Modeling

Digital Image Fundamentals:

Elements of Visual perception – A simple Image Model – Sampling and Quantization – Some Basic Relationship between Pixels.

Elements of digital image processing systems, Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation.

UNIT-II :

Image Transforms &Color Image Processing: 15 periods

Background, Some Basic Intensity Transformation Functions, Histogram Processing, Histogram Equalization, Histogram Matching (Specification), Local Histogram Processing, Using Histogram Statistics for Image Enhancement, Color Fundamentals , Color Models , The RGB Color Model , The CMYand CMYK Color Models , The HSI Color Model , Pseudo color Image Processing , Intensity Slicing , Intensity to Color Transformations , Basics of Full-Color Image Processing

UNIT- III :

IMAGE ENHANCEMENT IN SPATIAL DOMAIN: 8 periods

Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

UNIT-IV :

IMAGE ENHANCEMENT IN FREQUENCY DOMAIN: 12 periods

Background, Preliminary Concepts, Sampling and the Fourier Transform of Sampled Functions, The Basics of Filtering in the Frequency Domain, Image Smoothing Using Frequency Domain Filters, Image Sharpening Using Frequency Domain Filters, Selective Filtering.

UNIT-V :

IMAGE SEGMENTATION& Morphology: 15 periods

Edge detection, Edge linking via Hough transform – Thresholding - Regionbased segmentation – Region growing – Region splitting and Merging.

Preliminaries, Erosion and Dilation, Opening and Closing, the Hit-or-Miss Transformation, Some Basic Morphological Algorithms, Gray-Scale Morphology

TextBooks:

1. Gonzalez Rafael C and Woods Richard E," *Digital Image Processing*", 3rd Edition, Prentice Hall, 2008.
2. Anil K. Jain, PHI. Pattern Recognition and Image Analysis, Earl Gose and Richard Johnsonbaugh Steve Jost, PHI," *Fundamentals of Digital Image Processing"*.

ReferenceBooks:

1. Pratt William K, "*Digital Image Processing: PIKS Scientific Inside"*, 4th Edition, John Wiley, 2007. (TA1632.P917 2007) •
2. Pitas Ioannis, Digital Image Processing Algorithms and Applications, John Wiley, 2000. (TA1637.P681) •
3. Jain Anil K," *Fundamentals of Digital Image Processing"*, PrenticeHall, 1989. (TA1632.J25)

Web Resources:

https://www.tutorialspoint.com/dip/image_transformations.htm.ww
w.cs.uu.nl/docs/vakken/ibv/reader/chapter10.pd.
www.cs.haifa.ac.il/~dkeren/ip/lecture7.pdf

INTRODUCTION TO SOFT COMPUTING	
CSE 411(A)	**Credits: 3**
Instruction: 3 Periods & 1 Tut/ Week	Sessional Marks : 40
End Exam : 3Hours	End Exam Marks : 60

Prerequisites:

Knowledge of set and probability theory.

Basic knowledge of algorithms, Basic programming skills.

Course Objectives:

- To make the students to be familiar with the concept of classification techniques to solve real problems.
- To make the students to have general overview on selection and decision making strategies.
- To make the students gain knowledge about solving real world problems from biological inspired features.

Course Outcomes:

By the end of the course , the student will be able to:	
1.	To comprehend the basic concepts of artificial neural networks.
2.	To analyze different artificial neural network structures and their uses thereby.
3.	To analyze the mechanism Fuzzy logic and Fuzzy inference systems.
4.	To be able to solve classification and selection problems.
5.	To design fitness functions to solve various optimization problems.

1	2	3	4	5	6	7	8	9	10	11	12	1	2
3	1	1	3	1	0	2	2	2	3	1	3	1	3
3	2	3	3	3	1	3	3	2	3	1	3	1	3
3	0	2	3	2	1	3	2	3	3	1	3	1	3
3	2	3	3	3	1	3	3	3	3	1	3	2	3
3	1	3	3	3	1	3	3	3	3	1	3	2	3

SYLLABUS

UNIT-I : **10 Periods**

FUNDAMENTALS OF NEURAL NETWORKS :

Basic concepts of Neural Network; Human Brain; Model of an Artificial Neuron; Neural Network Architectures; Characteristics of Neural Networks; Learning Methods; Taxonomy of Neural Networks Architectures; History Of Neural Networks; Early Neural Network Architectures Applications:- ADALINE and MADALINE.

UNIT-II : **10 Periods**

BACKPROPAGATION NETWORKS :

Architecture of a Back Propagation Network; Back Propagation Learning:- Computation of input layer, hidden layer, and output layer, Calculation of error, Training of neural network, Method of steepest descent, Effect of learning rate; Back propagation algorithm; Application:- Classification of soil; Selection of various parameters of BPN.

UNIT-III : **8 Periods**

ADAPTIVE RESONANCE THEORY:

Introduction; ART1: Architecture, Special Features, Algorithm, Illustration; Applications:- Character recognition using ART1, Classification of soil.

UNIT IV : **10 periods**

FUZZY LOGIC:

Fuzzy Versus Crisp, Crisp sets, Fuzzy sets, Crisp relations, Fuzzy relations;
Fuzzy systems:- Crisp logic, Predicate logic, Fuzzy logic, Fuzzy rule based system, Defuzzification methods.

UNIT V: **12 Periods**

GENETIC ALGORITHMS:

Fundamentals of genetic algorithms:-History, Basic concepts, Creation of offspring, Working principle, Encoding, Fitness function, Reproduction; Genetic modeling:- Inheritance Operators, Cross over, Inversion and deletion, Mutation operator, Bit-Wise operators, Bit-Wise operators used in GA, Generational Cycle, Convergence of Genetic Algorithm; Applications:- Constrained optimization.

Text Book:

1. S. Rajasekaran and PG.A.V.Pai , "*Neural Networks, Fuzzy logic, and Genetic algorithms: synthesis and applications*", PHI Publication.

Reference Books:

1. Simon Haykin , "*Neural Networks: A Comprehensive Foundation* ", PHI Publication.
2. C. Eliasmith and CH. Anderson, "*Neural Engineering* ", PHI.
3. John Yen and Reza Langari , "*Fuzzy Logic¨Intelligence, Control and Information*", Pearson Publication.

Web Resources:

http://nptel.ac.in/courses/117105084/

WEB DESIGN			
CSE 411(B)		**Credits : 3**	
Instruction	: 3 Periods & 1 Tut/Week	Sessional	Marks : 40
End Exam	: 3 Hours	End Exam Marks : 60	

Prerequisites:

Student must have knowledge of some programming languages (such as C, C++)
Basic knowledge of computer fundamentals in JAVA programming language.

Course Objectives :

- now the advantages and use of different types of CSS
- o learn designing of dynamic and interactive web pages by embedding Java Script code in HTML.
- To design and to develop simple database driven web applications using a server-side scripting language
- To create good, effective and customized websites using various technologies.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Develop the static web pages using HTML
2.	Analyze a web project and identify its elements and attributes in comparison to traditional project.
3.	Demonstrate computational and problem solving skills as applied to the computing industry.
4.	Apply the knowledge to create dynamic web pages using Servlets ,JSP.
5.	Developweb application using software tools and identify the environments currently available on the market to design web sites

Mapping of course outcomes with program outcomes :

Mapping		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	2	3	3	2					2		3	3	2	3
	2		2	3	2					3	1	3	2	3	3
	3	2			2	1	1				2	2		2	2
	4	3		3	3					2	2	3	2	3	3
	5		2	3	2	3				3	2	3	2	3	3

SYLLABUS

UNIT-I: **12Periods**

HTML Common tags:

Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, Meta tags, Character entities, frames and frame sets, Web site structure.

Java Script:

Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script.

UNIT-II: **10 Periods**

XML:

Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX

UNIT –III: **16 Periods**

Web Servers and Servlets: Introduction to web server installation.

Introduction to Servlets: Lifecycle of a Servlet, The Servlet API, The javax.servelet Package, Reading Servlet parameters, Reading Initialization parameters. The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues.

UNIT-IV: **16 Periods**

JSP Application Development:

Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users Passing Control and Date between Pages – Sharing Session and Application Data – Memory Usage Considerations.

UNIT-V: **10 Periods**

Database Access:

Database Programming using JDBC, Studying Javax.sql.* package, Accessing a Database from Servlets &JSP Page , Application – Specific Database Actions.

Text Books:

1. Dietel and Nieto PHI/Pearson Education Asia., "*Internet and World Wide Web – How to program* ",4th edition,Pearson Education
2..Deitel/Deitel/Santry *,"Advanced Java™ 2 Platform How to Program," 2nd edition,OReily*
3. Hans Bergsten ,*Java Server Page*s, 3rd edition,SPD O'Reilly

Reference Books:

1. Steven Holzner, "*HTML Black Book: The Programmer's Complete HTML Reference Book*" Coriolis Group Books
2. Marty Hall and Larry Brown Pearson ,"*Core SERVLETS ANDJAVASERVERPAGES VOLUME 2: CORE TECHNOLOGIES",* 2 edition ,Prentice Hall

Web Resources:

https://www.w3schools.com/html/http
://www.javatpoint.com/jsp-tutorial

PROFESSIONAL ELECTIVE – IV

CLIENT SERVER COMPUTING	
CSE 421(A)	**Credits : 4**
Instruction **:** 4 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:

Fundamentals of Computer Networks and networking protocols.Fundamentals of Operating systems.
Fundamentals of Data bases and storage devices.

Course Objectives:

- Understand client/ server computing environment.
- Understand the network architecture of client/ server computing.
- Know the design aspects of the administrator of client/ server architecture.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Fundamental understanding of client server computing.
2.	Describe the components of client/ server applications.
3.	Analyze the client/ server network.
4.	Understand the developments of client/ server systems.
5.	Analyze the roles and responsibilities of server and database administrator.

Mapping of Course Outcomes with Program Outcomes:

Mapping		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	2	2									2	2		
	2	2	2									2	2		
	3			3		1						1	1		
	4	2	2									2	2		
	5						2		2	2			2		

SYLLABUS

UNIT-I: **12 periods**

Client/Server Computing: DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client server development tools, advantages of client server computing.

UNIT-II: **12 periods**

Components of Client/Server application: The client: services, request for services, RPC, windows services, fax, print services, remote boot services, other remote services, Utility Services & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), Common Object Request Broker Architecture (CORBA). The server: Detailed server functionality, the network operating system, available platforms, the network operating system, available platform, the server operating system

UNIT-III: **10 periods**

Client/Server Network: connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system development: Software, Client–Server System Hardware: Network Acquisition, PC-level processing unit, Macintosh, notebooks, pen, UNIX workstation, x-terminals, server hardware.

UNIT-IV: **12 periods**

Client Server Systems Development: Services and Support, system administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Network management, Help Disk, Remote Systems Management Security, LAN and Network Management issues.

UNIT-V: **12 periods**

Client/Server System Development: Training, Training advantages of GUI Application, System Administrator training, Database Administrator training, End-user training. The future of client server Computing Enabling Technologies, The transformational system.

Text Books:

2. Patrick Smith &SteaveGuengerich, "Client / Server Computing", PHI Learning Private Limited, DelhiIndia.

Reference Books :

2. Dawna Travis Dewire, "Client/Server Computing", Tata Mcgraw-hill Education Pvt. Ltd.
3. Majumdar& Bhattacharya, "Database management System", Tata Mcgraw-hill Education Pvt.Ltd.
4. Korth, Silberchatz, Sudarshan, "Database Concepts", Tata Mcgraw-hill Education Pvt. Ltd.
5. Elmasri, Navathe, S.B, "Fundamentals of Data Base System", Addison Wesley

Web Resources:

1. http://www.nptelvideos.com/video.php?id=1472
2. http://nptel.ac.in/courses/106105087/41

Augmented Reality	
CSE 421(B)	**Credits : 4**
Instruction **:** 4 Inst.& 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:

Basic knowledge on C and C++
Basic knowledge on computer graphics
Basic mathematical knowledge

Course Objectives:

- To make the candidate understand the importance of augmented reality and its future as an aiding tool
- To check out various hardware and software components for augmented reality applications.
- Learn to build different types of objects that can act as contents for augmented reality.
- To understand various application like of augmented reality and build a small application that works on AR Marker or QR Code.

COURSE OUTCOMES:

CO1- Will be able to understand augmented reality and its future as an aiding tool
CO2- Will be able to know and use different hardware and software components to build an augmented reality application
CO3- Will be able to design 3D or 2D objects that can act as contents for augmented reality application and also to make these objects interact with the real world.
CO4- Will be able to build a small mobile augmented reality app that works on AR Marker.
CO5- Will be able understand various application for augmented reality and work on those application areas

Mapping of Course Outcomes with Program Outcomes:

Mapping		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	1					2	2		1			2	1	3
	2	2		3	3	3	1			2		1	1		3
	3	3		2	1	3						1			3
	4	2	2	2	2	3				1			2		3
	5	3		3	2	1							1		3

SYLLABUS

Unit 1 **10 hours**

Argument that reality: Introduction, origins of augmented reality, explanation of augmented reality with different scenarios, relationship between augmented reality and other technologies.

Augmented reality concepts: Introduction, how does augmented reality work, concepts related to augmented reality, ingredients of an argument reality experience.

Unit 2 **14 hours**

Augmented reality hardware and software: Introduction, major hardware components for argument a reality systems, major software components for argument that reality systems, software is used to create content for augmented reality applications.

Unit 3 **12 hours**

Augmented reality content and interaction in Augmented reality: what is content, creating visual content like 3-D dimensional objects and today dimensional images, interaction in the real world, Manipulation, navigation.

Unit 4 **10 hours**

Mobile augmented reality: Introduction, what is mobile augmented reality, advantages and disadvantages of mobile augmented reality.

Unit 5 **12 hours**

Augmented reality applications: Introduction, what makes a good documented reality application, application areas.

TEXT BOOKS:

T1. Understanding Augmented Reality – Concepts and Applications by Alan B Craig, Elsevier Publications

REFERENCES BOOKS:

R1. Augmented Reality – An Emerging Technologies Guide to AR by Gregory Kipper, Elsevier Publications.

SEMANTIC WEB	
CSE 421(C)	**Credits : 4**
Instruction **:** 4 Inst.& 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:

Basic knowledge on java
Basic knowledge on web technologies
Basic mathematical knowledge

Course Objectives:

- To make the student understand the importance of semantic web and its role in making the web intelligent.
- To learn various concepts of semantic web like ontologies, RDF, RDF schema and OWL.
- Learn to build an ontology model for semantic web using different tools like protégé, jena ontology framework etc.,
- To understand various applications like software agents and semantic desktop

COURSE OUTCOMES:

CO1- Will be able to understand the semantic web as the future of the web and its importance
CO2- Will be able to understand and differentiate between taxonomies, thesauri and ontologies along with gaining knowledge on rules for building ontologies.
CO3- Will be able to describe a resource using RDF format along with working on RDF schema and OWL. And also developing the inference rules using rule languages.
CO4- Will be able to build an ontology model using the tools like protégé, Jena ontology framework.
CO5- Will be able to develop a small application of semantic web like a semantic desktop with limited functionality.

Mapping of Course Outcomes with Program Outcomes:

Mapping		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	1					2	2		1			2	1	3
	2	2				2	1			2		1	1		3
	3	3		2		1						1			3
	4	2	2	2	2	3				1			2		3
	5	3		3	2	1							1		3

Course Contents:

UNIT 1 **10 Hours**

Introduction to semantic Web: the syntactic web, the semantic Web, how was the semantic Web will work, what the semantic Web is not, what will be the side effects of the semantic Web.

UNIT 2 **10 Hours**

Introduction to ontology in computer science: defining the term ontology, differences among taxonomies, thesauri and ontologies, classifying ontologies, web ontology description languages.

Knowledge representation in description logic: introduction, and informal example, the family of attributive languages, inference problems.

UNIT 3 **14 Hours**

RDF and RDF schema: introduction, XML essentials, RDF, RDF schema and its vocabulary.

OWL: introduction, requirements for web ontology description language, header information versioning and annotation properties, properties, classes, individuals, data types.

Rule languages: introduction, usage scenarios for rule language, datalog, ruleml, swirl, triple.

UNIT 4 **12 Hours**

Methods for ontology development: introduction, Uschold and King ontology development method, Toronto virtual enterprise method, methontology, lexicon based ontology development method.

Ontology sources: introduction, metadata, upper ontologies.

Semantic Web software tools: introduction meta data and ontology editors like Dublin core metadata editor, OliEd, protégé ontology editor.

UNIT 5 **12 Hours**

Software agents: introduction, agent forms, agent architecture, agents in semantic Web context.

Semantic desktop: introduction, semantic desktop metadata, semantic desktop ontologies, semantic desktop architecture, semantic desktop related applications

TEXT BOOKS:

T1. SemanticWeb – Concepts, Technologies and Applications by Karin K Breitman, Springer

REFERENCES BOOKS:

R1. A Semantic Web Premier by Grigoris Antoniou, 2nd edition, MIT Press

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PROFESSIONAL ELECTIVE – IV

BIG DATA ANALYTICS	
CSE 421(D)	**Credits : 3**
Instruction **:** 3 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:
Basic Knowledge of statistics and probability theory,
Basic knowledge of databases.

Course Objectives:
- To make the students aware of pattern recognition techniques,
- To enable the students to develop pattern classificationmethodologies.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	know fundamental basis of big data,
2.	know the modern storage concepts and devices for storing big data,
3.	know big data processing algorithms,
4.	be able to handle and analyze business data,
5.	develop methods for business data analysis.

Mapping of Course Outcomes with Program Outcomes:

Mapping		PO												PSO	
		A	B	C	D	E	F	G	H	I	J	K	L	1	2
CO	1	1	2	0	1	1				2		1	1		1
	2	2	2		2	1	2			1		1	1	1	2
	3		2		2	2				1		1	1		3
	4	1	2		1	1				2		1	1		3
	5	3	3	2	2	2				2		1		1	3

SYLLABUS

UNIT-I: **10 periods**

Introduction:
Understanding big data, Concepts and terminologies, Characteristics, Types, Case study background and example, Business architecture and process management, Information and communication technology (ICT).

Adoption and Planning considerations:
Organization prerequisites, data procurement, privacy, security, provenance, data analytics life cycle, case study example.

UNIT-II: **12 periods**

Enterprise technologies and Big data business intelligence:
Online transaction processing (OLTP), Online analytical processing (OLAP), Extract transform load (ETL), Data warehouses, Data marts, traditional business intelligence, Big data business intelligence, Case study examples of business enterprise and big data business intelligence.

UNIT-III: **12 periods**

Storing and Analysis process:

Clusters, File systems and distributed file systems, NoSQL, Sharding and replication, CAP theorem, ACID, BASE, Case study example;

Processing concepts:

Parallel and distributed data processing, Hadoop, processing workloads, clusters, Map reduce, case study example.

UNIT-IV: **10 periods**

Storage technology:

On-disk storage devices, NoSQL databases, In-memory storage devices, Case study example.

UNIT-V: **14 periods**

Big data analysis techniques:

Quantitative and qualitative analysis, data mining, statistical analysis, machine learning, semantic analysis, visual analysis, case study example.

Text Books:

1. Thomas Erl, WajidKhattak, and Paul Buhler, "Big Data Fundamentals Concepts, Drivers & Techniques", Prentice Hall Service Technology.

.

Reference Books :

3. ArshdeepBahga , Vijay Madisetti, " *Big Data Science & Analytics: A Hands-On Approach* ", April 15, 2016, Copyrighted material.

Web Resources:

1. http://nptel.ac.in/noc/individual_course.php?id=noc17-mg24
2. https://www.coursera.org/specializations/big-data

PROFESSIONAL ELECTIVE – IV

INFORMATION SECURITY AND AUDITING	
CSE 421(E)	**Credits : 4**
Instruction **: 4** Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:

Computer Networks

Cryptography and Network Security

Course Objectives:

- Knowbasic information security concepts and attacking techniques.
- Have knowledge on common security policies, cryptographic tools.
- Basic knowledge on security at software and operating systems level.
- Gain knowledge on legal and ethical issues in information security systems.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Understand the basic concepts and general techniques in intrusion detection.
2.	Understand overflow attacks and learn to write safe program code.
3.	Describe basic concepts and general techniques in establishing security and audit in IT Infrastructure.
4.	Describe basic concepts and general techniques in risk assessment, handling legal and ethical issues.
5.	Understand internet protocol security and standards and operating system security.

Mapping of Course Outcomes with Program Outcomes:

	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1		2		1		2	1		1	1		1		1
CO2	2	1	1	2	2	1		2	1	2			1	1
CO3		1	2	2	2	1		1	2	1	1	1	1	
CO4		1	2	3	2	1		1	2	1	1	1	1	
CO5	2	2		2	2	1			2	2	2	1	1	

SYLLABUS

UNIT-I: **12 periods**

Overview: Computer security concepts, threats, attacks and assets, security functional requirements, security architecture for open systems, scope of computer security, computer security trends and strategy.

Computer Security Technology and Principles:

(Cover fundamentals of Cryptographic tools, authentication, access control.) Intrusion Detection:

Intruders, intrusion detection, intrusion detection systems- host-based, distributed host-based, network-based, distributed adaptive intrusion detection, intrusion detection exchange format, honey pots, example system: Snort.

UNIT-II: **12 periods**

Firewalls and Intrusion Prevention Systems: Need for firewalls, firewall characteristics, types of firewalls, firewall basing, firewall locations and configurations, intrusion prevention systems.

Software Security: Buffer Overflow-stack overflow, defending against buffer overflows, other forms of overflow attacks, software security issues, handling program input, writing safe program code, interacting with operating systems and other programs.

UNIT-III: **10 periods**

Management Issues: Physical and Infrastructure Security- overview, threats, prevention and mitigation methods, recovery from security breaches, threat assessment, planning and plan implementation, A Corporate Physical Security Policy-an example,integration of physical and logical security. Human Factors- Security awareness, training and education, organizational security policy, employment practices and policies, e-mail and internet use policies, A Corporate Security Policy Document-an example. Security Auditing- security auditing architecture, auditing trail, implementing logging function, audit trail analysis, An Integrated Approach-an example.

UNIT-IV: **12 periods**

Management Issues:IT Security Management and Risk Assessment-IT Security Management, organizational context and security policy, security risk assessment and analysis, Case Study: Silver Star Mines. IT Security Control Plans and Procedures- IT Security Management and implementation, safeguards, IT Security plan, implementation of controls and follow up, Case Study: Silver Star Mines. Legal and Ethical Aspects- cybercrime and computer crime, intellectual property, privacy, ethicalissues.

UNIT-V: **12 periods**

Internet security protocols and standards: secure sockets layer, transport layer security, IPv4and IPv6 security, secure mail and S/ MIME.Internet Authentication Applications: Kerberos, X.509, public key infrastructure, federal identity management.

Operating System Security:

Linux Security: Linux's security model, file system security, Linux vulnerabilities, Linux system hardening, application security, mandatory access controls.

Windows and Windows Vista security: Windows security architecture, windows vulnerabilities, windows security defenses, browser defenses, cryptographic services.

Text Books:

1. W. Stallings, "Computer Security: Principles and Practice," 2nd Edition, Prentice Hall, ISBN: 0132775069, 2011.

Reference Books :

1. M. Stamp, "Information Security: Principles and Practice," 2nd Edition, Wiley, ISBN: 0470626399, 2011.
2. M. E. Whitman and H. J. Mattord, "Principles of Information Security," 4th Edition, Course Technology, ISBN: 1111138214,2011.
3. M. Bishop, "Computer Security: Art and Science," Addison Wesley, ISBN: 0-201-44099-7, 2002.
4. G. McGraw, "Software Security: Building Security In," Addison Wesley, ISBN: 0321356705, 2006.Krishna, *"Object Oriented Programming through Java*", Universities Press.

Web Resources:

1. https://www.coursera.org/learn/enterprise-infrastructure-security
2. https://www.coursera.org/learn/secure-networked-system-with-firewall-ids
3. https://www.coursera.org/learn/planning-auditing-maintaining-enterprise-systems
4. https://www.coursera.org/learn/software-security

SOCIAL NETWORK ANALYSIS	
CSE 421(F)	**Credits : 3**
Instruction **:** 3 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:

Basic Knowledge of Data structures& Algorithms, Computer Networks and Data communication

Course Objectives:

- To understand the functionality of a social network.
- To model and visualize the social network.
- To mine the users in the social network.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Work on the internal components of the social network.
2.	Model and visualize the social network.
3.	Mine the behavior of the users in the social network.
4.	Analyze the opinion of the user.
5.	Predict security and privacy issues in real social networking sites.

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	**1**													
	2		**2**	**2**	**1**					**1**				**1**	
	3	**1**	**2**	**2**						**1**				**1**	**2**
	4		**2**	**2**						**1**				**1**	**2**
	5					**3**									**2**

SYLLABUS

UNIT-I: 12 periods

Introduction: Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Statistical Properties of Social Networks -Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Discussion networks - Blogs and online communities - Web-based networks.

UNIT-II: 12 periods

Modeling And Visualization: Visualizing Online Social Networks - A Taxonomy of 26 Visualizations - Graph Representation - Centrality- Clustering - Node-Edge Diagrams - Visualizing Social Networks with Matrix-Based Representations- Node-Link Diagrams - Hybrid Representations - Modelling and aggregating social network data – Random Walks and their Applications –Use of Hadoop and Map Reduce - Ontological representation of social individuals and relationships.

UNIT-III: **12 periods**

Mining Communities: Aggregating and reasoning with social network data- Advanced Representations - Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks.

UNIT-IV: **12 periods**

Text and Opinion Mining: Text Mining in Social Networks -Opinion extraction – Sentiment classification and clustering - Temporal sentiment analysis - Irony detection in opinion mining - Wish analysis - Product review mining – Review Classification – Tracking sentiments towards topics over time.

UNIT-V: **12 periods**

Privacy in online social networks: Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

Tools: Gephi, Palladio, NodeXL

Text Books:

1. Peter Mika, "Social Networks and the Semantic Web", 1st edition, Springer,2007.
2. BorkoFurht, "Handbook of Social Network Technologies and Applications", 1stedition, Springer, 2010

Reference Books :

1. Charu C. Aggarwal, "Social Network Data Analytics", Springer; 2011.
2. GuandongXu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", 1st edition, Springer,2011.
3. Giles, Mark Smith, John Yen, "Advances in Social Network Mining and Analysis", Springer, 2010.
4. Ajith Abraham, Aboul Ella Hassanien, VáclavSnáel, "Computational Social Network Analysis: Trends, Tools and Research Advances", Springer, 2009.
5. Toby Segaran, "Programming Collective Intelligence", O'Reilly, 2012.
6. SuleGündüz-Ogüdücü, A. ŞimaEtaner-Uyar, "Social Networks: Analysis and Case Studies", Springer, 2014

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc16_cs07/preview
2. https://gephi.org/
3. https://sites.google.com/a/umn.edu/social-network-analysis/home

PROFESSIONAL ELECTIVE – V 4/4 CSE Students

NETWORK MANAGEMENT	
CSE 422(A)	**Credits : 3**
Instruction **:** 3 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:

Basic Knowledge of Networking Fundamentals

Basic Knowledge of protocols.

Course Objectives:

- To understand the principles of network management, different standards and protocols used in managing complex networks.
- To understand the Automation of network management operations and making use of readily available network management systems.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Acquire the knowledge about network management standards (OSI and TCP/IP)
2.	Acquire the knowledge about various network management tools and acquire the skill to use them in monitoring a network
3.	Analyse the challenges faced by Network managers
4.	Evaluate various commercial network management systems and open network management systems.
5.	Analyse and interpret the data provided by an NMS and take suitable actions

Mapping of Course Outcomes with Program Outcomes:

Mapping		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	1	3	3										2	1
	2		2	2	2									2	
	3		3	3		2								1	
	4				2	2								1	
	5		3	3		3								1	1

SYLLABUS

UNIT - I **10 HOURS**

Data communications and Network Management Overview : Analogy of Telephone Network Management, Communications protocols and Standards, Case Histories of Networking and Management, Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions, Network and System Management, Network Management System Platform, Current Status and future of Network Management.

UNIT - II **15 HOURS**

SNMPV1 Network Management: Organization and Information and Information Models. Managed network : Case Histories and Examples, The History of SNMP Management, The SNMP Model, The Organization Model, System Overview, The Information Model.

SNMPv1 Network Management: Communication and Functional Models. The SNMP Communication Model, Functional model.

UNIT – III **10 HOURS**

SNMP Management: SNMPv2: Major Changes in SNMPv2, SNMPv2 System Architecture, SNMPv2 Structure of Management Information, The SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility With SNMPv1.

UNIT - IV **15 HOURS**

SNMP Management: RMON : What is Remote Monitoring? , RMON SMI and MIB, RMON1, RMON2, ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON

UNIT – V **10 HOURS**

Network Management Tools and Systems: Network Management Tools, Network Statistics Measurement Systems, Network Management systems, Commercial Network management Systems, System Management, Enterprise Management Solutions. **Web-Based Management:** NMS with Web Interface and Web-Based Management, Web Interface to SNMP Management,

TEXT BOOK :

- Network Management, Principles and Practice, Mani Subrahmanian, Pearson Education.

REFERENCES :

1. Network management, Morris, Pearson Education.
2. Principles of Network System Administration, Mark Burges, Wiley Dreamtech.
3. Distributed Network Management, Paul, John Wiley.

WEB REFERENCES :

http://nptel.iitm.ac.in/courses/IIT-MADRAS/ Computer_Networks/

PROFESSIONAL ELECTIVE – V

FUZZY COMPUTING	
CSE 422(B)	**Credits : 3**
Instruction **:** 3 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:

Basic Knowledge of mathematical function and relation.Knowledge of set theory and logical operations.

Course Objectives:

- To understand Fuzzy logic and inference system.
- To learn automated method of learning.
- To be able to applydecision making and classification techniques.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Differentiate between Fuzzy sets and crisp sets and their relational operations.
2.	Apply Fuzzification and de-Fuzzification with different member functions.
3.	Implement different automated methods of learning.
4.	Do decision making while solving problems for engineering applications.
5.	Classify and recognition patterns of discriminative classes.

Mapping of Course Outcomes with Program Outcomes:

Mapping		PO												PSO	
		A	B	C	D	E	F	G	H	I	J	K	L	1	2
CO	1		2		1							1			1
	2	3	2		1					1		1		1	2
	3	2	3		1					2		1		2	3
	4	3	3		2					3		3		1	3
	5	3	3		3					3		3		1	2

SYLLABUS

UNIT-I: **10 periods**

Fuzzy systems:

Introduction, History, Utility, Limitations, Uncertainty, accuracy and information, Fuzzy set, Fuzzy membership, Sets in hypercube.

Fuzzy sets:

Function and mapping in classical sets, Crisp versus Fuzzy set, Operations on Fuzzy sets, Properties.

UNIT-II: **12 periods**

Crisp and Fuzzy Relations:

Cardinality and properties of crisp relations, Operations on crisp relations, Cardinality and properties of Fuzzy relations, Operations on Fuzzy relations, Fuzzy Cartesian product and composition, Crisp tolerance and equivalence relations, Fuzzy tolerance and equivalence relations, Value assignments, Cosine amplitude, Max–Min method, Other similarity methods.

UNIT-III: **12 periods**

Logic and Fuzzy System:

Membership function and it's features, Fuzzification and its types, Defuzzification, λ-cuts for Fuzzy relations, Defuzzification to Scalars, Classical logic, Proof,Fuzzy logic, Approximate reasoning, Other forms of the implication operation, Rule-based systems, Graphical techniques of inferences, Membership value assignments through intuition, inference, and rank ordering.

UNIT-IV: **08 periods**

Automated Methods:

Batch least squares algorithm, Recursive least squares algorithm, Gradient method, Clustering method, Learning from examples, Modified learning from examples.

UNIT-V: **14 periods**

Decision Making:

Synthetic evaluation, Ordering, Non-transitive ranking, Preference and consensus, Multi-objective decision making.

Classification: Classifying by equivalence relations,Crisp relations and Fuzzy relations, Cluster analysis, Cluster validity, Hard c-Means (HCM) and Fuzzy c-Means (FCM), Fuzzy c-Means Algorithm.

Text Books:

4. Timothy J. Ross, "*Fuzzy Logic with Engineering Applications*", Third Edition, Wiley.

Reference Books :

10. S. Rajasekaran, G.A.V. Pai*,"Neural Network, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications",*PHI.

Web Resources:

1. http://nptel.ac.in/courses/106105173/2
2. http://nptel.ac.in/courses/108104049/16#

WIRELESS SENSOR NETWORKS	
CSE 422(C)	**Credits: 3**
Instruction: 3 Periods & 1Tut/ Week	Sessional Marks : 40
End Exam: 3Hours	End Exam Marks : 60

Prerequisites:

To Undertake this course student must have basic understanding of Computer Networks, Data Communications and Networking Technologies.

Prior knowledge of database and data strucutures

Course Objectives:

- To make students understand with the fundamentals and terminology of wireless sensor networks.
- To provide students a sound foundation of the wireless sensor networks so that they are able to design / propose the suitable network for the required application.
- Student will examine protocols and algorithms used to operate the wireless sensor network and will explore the challenges and research issues in the field of wireless sensor networks.

Course outcomes:

1. Memorizing the concepts and the need of wireless sensor networks.
2. Apply the infrastructure of the WSAN.
3. Analyse the routing protocols & algorithms to implement the wireless sensor networks.
4. Identify the challenges of wireless sensor networks.
5. Evaluating the problems of critical nodes and links.

Mapping of course outcomes with program outcomes:

Mapping		**PO**												**PSO**	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**
	2	**1**	**3**	**3**	**2**	**2**		**2**	**1**	**2**	**2**		**2**	**2**	**1**
	3	**2**	**3**	**2**	**3**	**2**		**1**	**1**	**2**	**2**		**2**	**2**	**2**
	4	**1**	**2**	**2**	**3**	**2**	**2**	**1**	**1**	**2**	**2**	**1**	**2**	**1**	**1**
	5	**2**	**3**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**2**	**1**	**2**

SYLLABUS

Unit – I : 10 Periods

Overview of Wireless sensor and actuator networks, comparison of adhoc network, infrastructure network and sensor networks. Introduction to wireless sensor Networks and wireless sensor actuator networks, Terminology WSN architecture, requirements and standards, Topologies uses in Wireless sensor and actuator network.

Unit–II: 10 Periods

Applications of wireless sensor networks and wireless sensor actuator networks, , what the challenges ,issues in wireless sensor actuator networks ?requirement for wireless sensor network deployment various standards for WSAN Development of sensor network. Overview of broadcasting techniques, backbone and broadcasting in sensor actuator networks, coverage and connectivity criteria.

Unit- III: **10 Periods**

Placement and deployment of sensors in wireless sensor networks.Static sensors and mobile sensors placements.

Placement by Actuataros:- Least Recently Visited Approach, Snake like Deployment Approach, Back-Tracking-Deployment Approach

Different methods used for sensor placement and deployment, Issues with the wireless sensor network deployment

Sensor Self Depolyment Methods:-Virtual Force/Vector Based Approach, Voronoi Based Approach, Mobile Sensor Migration

Unit – IV : **12 Periods**

Multicasting, multi rating casting, geocasting and any casting in sensor network,

Routing in Wireless Sensor and Actuator Networks :flooding, gossiping, classification of routing protocols, Study of types of routing protocols used in wireless sensor network.

Routing protocols based on network strucutures:- Flat networks routing – directed diffusion, SPIN, Rumor, GBR hierarchicial networks routing :- LEACH,PEGASIS,TEEN routing, location based routing :- Greedy, Face, Geographic adaptive fidelity, Geographic and energy aware routing.

Unit-V: **12 Periods**

Sink Mobility :- Data gathering in delay tolerant Wireless Sensor Networks : - Sink tour and RP based data collection methods : Direct contact data collection, Rendezvous based data collection, Introduction to sink mobility, energy problems

Topology Control in Sensor, Actuator : - use of MST and LMST , Introduction and detection of critical nodes and links : how to identify the critical nodes and links, how to solve the problem of critical nodes and critical links.

Text Book:

1.Wireless Sensor and Actuator Networks Algorithms and Protocols for Scalable Coordination and Data Communication, Edited by AmiyaNayak and Ivan Stojmenovic A JOHN WILEY & SONS, INC., PUBLICATION,2010.

Reference Books:

1. Wireless Communications & Networks, 2nd Edition, William Stallings ,PearsonEducation India,2009.

2. Wireless Sensor Networks: An Information Processing Approach,Feng Zhao and Leonidas Guibas ,Morgan Kauffman Publication,2004.

Web Resources:

http://nptel.ac.in/courses/106105160/21https://online courses.nptel.ac.in/noc17_cs07/preview

CLOUD COMPUTING	
CSE 422(D)	**Credits: 3**
Instruction: 3Periods & 1Tut/ Week	Sessional Marks : 40
End Exam: 3Hours	End Exam Marks : 60

Prerequisites:

To Undertake this course student must have basic understanding of Data Communications and Networking Technologies.

Prior knowledge of computing and about the software systems.

Student must be familiar with the concept of , parallel and distributed programming

Course Objectives:

- To make students understand with the fundamentals and essentials of Cloud Computing.
- To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
- To enable students exploring some important cloud computing driven commercial systems such as GoogleApps, Microsoft Azure and Amazon Web Services and other businesses cloud applications

Course outcomes:

By the end of the course, the student will be able to:	
1.	To be familiar with the basics, challenges, need of cloud computing.
2.	Able to identify infrastructure of cloud
3.	Describing different cloud services
4.	Analyzing different cloud data storage and cloud security
5.	To analyze the need to migrate to the cloud and how cloud computing might evolve

Mapping of course outcomes with program outcomes:

Mapping		PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	2	2			1				2	2	2	2		
	2	3	3	1		2				2	2	3	2		
	3	3	3	2		2				2	2	3	2		
	4	3	3	2		2				2	2	3	2		
	5	2	2	2		1				2	2	3	3		

SYLLABUS

Unit – I : 10 Periods

Cloud Computing Basics:

Cloud Computing Overview, Classify and describe the architecture and taxonomy of parallel and distributed computing, including shared and distributed memory, and data and task parallel computing. Explain and contrast the role of Cloud computing within this space. Intranets and the Cloud, FirstMovers in the Cloud. The Business Case for Going to the Cloud - Cloud Computing Services introduction

Unit–II: **10 Periods**

Hardware and Infrastructure–Clients:

Mobile, Thick, Thin, Security:- Data Leakage, Offloading work, Logging, Forensics, Compliance VPNs, Key management ,Network- four different levels : Basic Public Internet, The Accelerated Internet, Optimized Internet Overlay Site-to-Site VPN, Services : - identify, integration, mapping, payment, search. Accessing the Cloud –Platforms.

Unit- III: **10Periods**

Cloud Services:

Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), Software plus services - Overview, Cloud computing applications and business case for going to the cloud, Infrastructure as a Service--Amazon EC2, Platform as a Service—Right Scale, Salesforce.com ,Software as a Service--Google App Engine and Salesforce , --Microsoft's take on SaaS is slightly different with their Software plus Services (sometimes they shorten it to S+S) Software plus Services

Unit – IV : **12 Periods**

Cloud Storage and data storage security:

What is cloud storage? uses of cloud storage, Types of cloud storage, things looked for cloud storage, infrastructure, data types used in cloud computing, Data security challenges, VPN-Virtual Private Network ,FADE – File assured deletion ,TPA – Third Party Auditing. Cloud Security – need for security and privacy in cloud computing, Security and privacy issues

Unit-V: **12 Periods**

Local Clouds, Thin Clients, Thick clients:

Types of Virtualizations, Virtualization in Your Organization, Server Solutions, Thin Clients, Migrating to the Cloud - Cloud Services for Individuals, Cloud Services Aimed at the Mid-Market, Enterprise-Class Cloud Offerings, Migration, Best Practices and the Future of Cloud Computing - Analyze Your Service, Best Practices, How Cloud Computing Might Evolve. Demonstration on VMware.

Text Book:

2. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter. "*Cloud Computing-A Practical Approach", 1stEdition,* McGrawHill.

Reference Books:

1. Derrick Rountree and lleanaCastrillo, "*The Basics of Cloud Computing* ",
2. L. Wang, R. Ranjan, J. Chen, and B. Benatallah, "*Cloud Computing: Methodology, Systems, and Applications*", CRC Press, Boca Raton, FL,USA, ISBN: 9781439856413, October 2011.
3. Buyya R., Broberg J., Goscinski A., "*Cloud Computing: Principles and Paradigms*", John Wiley & Sons Inc., ISBN: 978-0-470-88799-8, 2011.

Web Resources:

1. http://nptel.ac.in/courses/106106129/28
2. https://www.coursera.org/learn/cloud-computing
3. https://www.edx.org/course/subject/computer-science/cloud-computing
4. http://www.guru99.com/cloud-computing-for-beginners.html
5. http://www.pritee.org/index.php/study-material/cloud-computing
6. https://cloudacademy.com/

PROFESSIONAL ELECTIVE – V

COMPUTING OPTIMIZATION	
CSE 422(E)	**Credits : 3**
Instruction **:** 3 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites:

Basic Knowledge of algorithms and data structures.

Course Objectives:

- To understand evolutionary computing.
- To learn genetic algorithms.
- To be able to apply optimization techniques for solving latest computing problems.

Course Outcomes:

By the end of the course, the student will be able to:	
1.	Develop optimization models for various problem specific solutions.
2.	Apply evolutionary programming and strategies in engineering aspects.
3.	Design fitness functions.
4.	Apply variety of evolutionary programming computing techniques.

Mapping of Course Outcomes with Program Outcomes:

Mapping		PO												PSO	
		A	B	C	D	E	F	G	H	I	J	K	L	1	2
CO	1		2		2							1		1	2
	2	2	3		2					2		1		2	2
	3	3	2		3					3		2		2	3
	4	3	2		3					2		2		1	3

UNIT-I: **10 periods**

Introduction to Evolutionary Optimization:

Evolutionary algorithm, History, Application and need, Un-constrained optimization, Constrained Optimizations, Multi-objective optimization, Multi-modal optimization, Combinatorial optimization, Hill-climbing, Monte-Carlo importance, Intelligence- Adaptation, Randomness, Communication.

UNIT-II: **10 periods**

Genetic Algorithm (GA):

History- Charles Darwin, Gregor Mendel; A simple binary GA; Simple GA for Robot design; Selection; Cross-over; Mutation; Tuning parameters, Simple continuous GA.

UNIT-III: **12 periods**

Modeling GA:

Schema theory; Markov chains; Markov model for GA- Selection, mutation and cross-over; Dynamic system model- Selection, Mutation, Cross-over;

UNIT-IV: **12 periods**

Evolutionary Programming (EP) and Strategies:

Continuous EP; Finite-state-machine optimization; Discrete evolutionary programming; The Prisoner's dilemma; Artificial ant problem; (1 + 1) evolutionary strategy; The 1/5 rule of derivation; The (μ + 1) evolution strategy; The (μ + λ) and (μ, λ) evolution strategy; Self-adaptive evolution strategy.

UNIT-V: **14 periods**

Genetic Programming (GP):

Overview of LISP; Fundamentals of GP- Fitness measures, Termination criteria, Termination set and Function set, Initialization; GP Parameters; Mathematical analysis of GP.

Evolutionary Algorithm Variation:

Initialization; Convergence; Gray-coding; Elitism; Population diversity; Selection options; Recombination; Mutation.

Text Books:

5. Dan Simon*," Evolutionary Optimization Algorithms",* Wiley.

Reference Books :

1. ZbigniewMichalewicz, "*Genetic Algorithms + Data Structures = Evolution Programs*", Springer.

Web Resources:

3. https://onlinecourses.nptel.ac.in/noc18_me17/preview
4. http://nptel.ac.in/courses/105108081/37