Detailed Scheme

ACADEMIC YEAR 2020-2021

Dr. Ambedkar Institute of Technology
Bangalore

I-II (2020-2022 BATCH)

M.Tech in Computer Network Engineering

Department Of Information Science and Engineering

Dr. Ambedkar Institute of Technology

SCHEME OF TEACHING AND EXAMINATION (Autonomous) for Academic Year 2020-21

M. Tech in Computer Network Engineering

Batch:2020-2022

I semester

Sl. No.	Sub Code	Subject Title	Teaching Department	Teaching hours per week			Maximum Marks allotted			Examination Credits
				Lecture	Tutorial/ Seminar/ Assignment	Practical / Project	CIE	SEE	Total	
1.	20SCN11	Probability Statistics and Queuing theory	**MAT**	4	-	-	50	50	100	**3**
2.	20SCN12	Advances in Computer Networks	ISE	4	-	-	50	50	100	**3**
3.	20SCN13	Cryptography and Network Security	ISE	4	-	-	50	50	100	**3**
4.	20SCN14	Cloud Computing	ISE	4	-	-	50	50	100	**3**
5.	20SCN15X	ELECTIVE – I	ISE	4	-	-	50	50	100	**3**
6.	20SCNL16	Computer Networks and CNS Laboratory	ISE	-	-	3	50	50	100	**2**
7.	20SCNS17	Technical Seminar	ISE	-	2	-	50	-	50	**2**
8.	20SCNM18	Mini project/ Industry visit/ Field work	ISE	-	-	6	50	-	50	**2**
Total							**400**	**300**	**700**	**21**

Technical Seminar: Seminar on Advanced topics from refereed journals by each student.

ELECTIVE I

Sl .No	Name of the Subject	Subject Code
1	Wireless Ad Hoc Networks	20SCN151
2	Internet of Things	20SCN152
3	Trends In Artificial Intelligence And Soft Computing	20SCN153
4	Advanced Storage Area Networks	20SCN154

HEAD DEPT. OF INFORMATION SCIENCE & ENGG

Dr. Ambedkar Institute of Technology
SCHEME OF TEACHING AND EXAMINATION (Autonomous) for Academic Year 2020-21
M. Tech in Computer Network Engineering
Batch:2020-2022

II Semester

Sl. No.	Sub Code	Subject Title	Teaching Department	Teaching hours per week			Maximum Marks allotted			Examination Credits
				Lecture	Tutorial/ Seminar/ Assignment	Practical / Project	CIE	SEE	Total	
1.	20SCN21	Big Data Analytics	ISE	4	-	-	50	50	100	**3**
2.	20SCN22	Network Management	ISE	4	-	-	50	50	100	**3**
3.	20SCN23	Python Programming	ISE	4	-	-	50	50	100	**3**
4.	20SCN24	Cyber Laws and Ethics	ISE	4	-	-	50	50	100	**3**
5.	20SCN25X	ELECTIVE – II	ISE	4	-	-	50	50	100	**3**
6.	20SCNL26	Cloud Computing and Big Data Lab	ISE	-	-	3	50	50	100	**2**
7.	18RM27	Research Methodology	ISE	-	2	-	50	50	100	**2**
8.	20SCNL28	Mini project/ Industry visit/ Field work	ISE	-	-	6	50	-	50	**2**
Total							**400**	**350**	**750**	**21**

ELECTIVE-II

Sl .No	Name of the Subject	Subject Code
1	Artificial Intelligence & Agent Technology	20SCN251
2	Digital Image Processing	20SCN252
3	Wireless Sensor Networks	20SCN253
4	Mobile Application Development	20SCN254

HEAD DEPT. OF INFORMATION SCIENCE & ENGG

I SEMESTER

Sub Title : PROBABILITY STATISTICS AND QUEUING THEORY		
SubCode:20SCN11	**No. of Credits:3= 3:0:0 (L-T-P)**	**No.of Lecture Hours/Week :4**
Exam Duration : 3 hours	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 52**

Course Objectives:

1.Develop analytical capability and to impart knowledge of Probability, Statistics and Queuing.

2. Apply above concepts in Engineering and Technology.

3.Acquire knowledge of Hypothesis testing and Queuing methods and their applications so as to enable them to apply them for solving real world problems

UNIT No	Syllabus Content	No of Hours
1	Axioms of probability, Conditional probability, Total probability, Baye's theorem, Discrete Random variable, Probability mass function, Continuous Random variable. Probability density function, Cumulative Distribution Function, and its properties, Two-dimensional Random variables, Joint pdf / cdf and their properties	**12**
2	Probability Distributions / Discrete distributions: Binomial, Poisson Geometric and Hyper-geometric distributions and their properties. Continuous distributions: Uniform, Normal, exponential distributions and their properties	**10**
3	Random Processes: Classification, Methods of description, Special classes, Average values of Random Processes, Analytical representation of Random Process, Autocorrelation Function, Cross-correlation function and their properties, Ergodicity, Poisson process, Markov Process and Markov chain.	**10**
4	Testing Hypothesis: Testing of Hypothesis: Formulation of Null hypothesis, critical region, level of significance, errors in testing, Tests of significance for Large and Small Samples, t-distribution, its properties and uses, F-distribution, its properties and uses, Chi-square distribution and its properties and uses, $\chi 2$ – test for goodness of fit, $\chi 2$ test for independence.	**10**
5	Symbolic representation of a Queuing Model, Poisson Queue system, Little Law, Types of Stochastic Processes, Birth-Death Process, The M/M/1 Queuing System, The M/M/s Queuing System, The M/M/s Queuing with Finite buffers.	**10**

Note 1: All units will have internal choice

Note 2: Three Assignments are evaluated for 10 marks:

Assignment – I from Units 1 and 2.

Assignment – II from Units 3 and 4
Assignment -III from Unit 5

Note 3:Subject Seminar and Group activity is evaluated for 10 marks

Course Outcomes:
After the completion of the above course students will be able to:
CO1: Demonstrate use of probability and characterize probability models using probability mass (density) functions & cumulative distribution functions.
CO2: Explain the techniques of developing discrete & continuous probability distributions and its applications.
CO3: Outline methods of Hypothesis testing for goodness of fit
CO4: Define the terminology &nomenclature appropriate queuing theory and also distinguish various queuing models.

COs	**Mapping with POs**
CO1	PO3,PO4,PO7,PO9,PO10
CO2	PO2,PO3,PO4,PO9,PO12
CO3	PO2,PO3,PO4,PO9,PO12
CO4	PO2,PO3,PO4,PO9,PO12

TEXT BOOKS:

1. Probability, Statistics and Queuing Theory, V. Sundarapandian, Eastern Economy Edition, PHI Learning Pvt. Ltd, 2009.

REFERENCE BOOKS / WEBLINKS:

1. Probability & Statistics with Reliability, Queuing and Computer Applications, 2 nd Edition by Kishor. S. Trivedi , Prentice Hall of India ,2004.
2. Probability, Statistics and Random Processes, 1st Edition by P Kausalya, Pearson Education, 2013.

Course Title : ADVANCES IN COMPUTER NETWORKS		
CourseCode: 20SCN12	**No. of Credits:3=3: 0 : 0 (L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 52**

Course objectives:

1. Overview of Computer Networks.
2. To understand various Network architectures.
3. Concepts of network protocols.
4. To become familiar with the network traffic, congestion, controlling and resource allocation.

Unit No.	Syllabus	No of Hours
1	**Introduction:** Building a Network, Requirements, Perspectives, Scalable Connectivity, Cost-Effective Resource sharing, Support for Common Services, Manageability, Protocol layering, Performance, Bandwidth and Latency, Delay X Bandwidth Product, Perspectives on Connecting, Classes of Links, Reliable Transmission, Stop-and-Wait , Sliding Window, Concurrent Logical Channels. Text: Chapter-1.1-1.5, 2.1,2.4-2.5	**10**
2	**Internetworking I:** Switching and Bridging, Datagram's, Virtual Circuit Switching, Source Routing, Bridges and LAN Switches, Basic Internetworking (IP), What is an Internetwork ?, Service Model, Global Addresses, Datagram Forwarding in IP, Sub netting and classless addressing, Address Translation(ARP), Configuration(DHCP), Error Reporting(ICMP), Virtual Networks and Tunnels. Text: Chapter-3.1-3.2	**12**
3	**Internetworking- II:** Network as a Graph, Distance Vector(RIP), Link State(OSPF),Metrics, The Global Internet, Routing Areas, Routing among Autonomous, systems(BGP), IP Version 6(IPv6), Mobility and Mobile IP. Implementing and Performance of switches,Ports and Routers. Text: Chapter-3.3-3.4, 4.1- 4.4	**10**
4	**Network Protocols:** Simple Demultiplexer (UDP), Reliable Byte Stream(TCP), End-to-End Issues, Segment Format, Connecting Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, Record Boundaries,TCP Congestion Control, Additive Increase/ Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery.	**10**

	Text: Chapter-5.1-5.4	
5	**Congestion Control and Resource Allocation:** Congestion-Avoidance Mechanisms,DEC bit, Random Early Detection (RED), Source-Based Congestion Avoidance. The Domain NameSystem(DNS),Electronic Mail(SMTP,POP,IMAP,MIME),World Wide Web(HTTP),Network Management(SNMP) . Text: Chapter-9.1-9.3	**10**

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar is evaluated for 10 marks

Course Outcomes:
After completing the course the students are able to:
CO1: Analysis of network services, protocols and architectures, explain why they are layered.
CO2: Design & implement Internet applications and their protocols using the sockets API.
CO3: Develop& implement effective communication mechanisms using techniques like connection establishment, queuing theory, recovery.
CO4: Implement various congestion control techniques.

Cos	Mapping with PO's
CO1	PO2,PO4,PO6
CO2	PO3,PO4,PO7,PO9
CO3	PO3,PO5
CO4	PO3,PO4,PO11

TEXT BOOKS:

1. **Larry Peterson and Bruce S Davis** "Computer Networks :A System Approach" 5th Edition , Elsevier -2014

REFERENCE BOOKS:

1. **Uyless Black** "Computer Networks, Protocols , Standards and Interfaces" 2nd Edition - PHI
2. **Behrouz A Forouzan**"TCP/IP Protocol Suite" 4th Edition – Tata McGraw-Hill
3. **Douglas E Comer, "** Internetworking with TCP/IP, Principles, Protocols and Architecture" 6th Edition, PHI - 2014

Course Title : CRYPTOGRAPHY AND NETWORK SECURITY		
Course Code: 20SCN13	**No. of Credits: 3= 3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3hours	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 52**

Course Objectives:

1. To understand the fundamentals of Cryptography .
2. To acquire knowledge on standard algorithms used to provide security.
3. To understand the various key distribution and management schemes.
4. To gain knowledge of securing data in transit across networks

UNIT No	Syllabus Content	No of Hours
1	**Classical Encryption Techniques:** Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One Time Pad (Text Book : Chapter-1:1,2,3) **Block Ciphers and the data encryption standard:** Traditional block Cipherstructure, stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm. (Text Book : Chapter-2: 1,2,3,4,5)	**10**
2	**Public-Key Cryptography and RSA** Principles of public-key cryptosystems. Publickey cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. Text Book : Chapter-8: 1,2 **Other Public-Key Cryptosystems:** Diffie-hellman key exchange: The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic: Abelian groups, elliptic curves over real numbers, elliptic curves over Zp, elliptic curves over GF(2m) Elliptic curve cryptography: Analog of Diffie-hellman key exchange, Elliptic curve encryption/decryption, security of Elliptic curve cryptography. Pseudorandom number generation: PRNG based on RSA PRNG Based on ECC. Text Book : Chapter-9:1,2,3,4,5	**10**

3	**Key Management and Distribution** Symmetric key distribution using Symmetric encryption:A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage,Symmetric key distribution using asymmetric encryption: simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme.Distribution of public keys: public announcement of public keys, publicly available directory, public key authority, public keys certificates.X-509 certificates: Certificates, X-509 version 3 Text Book : Chapter-13: 1,2,3,4,5 **User Authentication** Remote user Authentication principles: Mutual Authentication, one way Authentication.Remote user Authentication using Symmetric encryption:Mutual Authentication, one way Authentication. **Kerberos:** Motivation , Kerberos version 4, Kerberos version 5:Differences between version 4 and 5 Remote user Authentication using Asymmetric encryption: Mutual Authentication, one way Authentication Federated identity management: identity management, identity federation Text Book : Chapter-14: 1,2,3,4 ,5	**10**
4	**Transport –Level Security** Web Security Considerations: Web Security Threats, Web Traffic Security Approaches.Secure Sockets Layer: SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, and shake Protocol, Cryptographic Computations. Transport Layer Security:Version Number, Message Authentication Code, Pseudorandom Functions, Alert Codes, Cipher Suites, Client Certificate Types, Certificate Verify And Finished Messages, Cryptographic Computations, Padding. HTTPS :Connection Initiation, Connection Closure. Secure Shell (SSH) Transport Layer Protocol, User Authentication Protocol, Connection Protocol. Text Book : Chapter-15: 1,2,3,4,5	**10**

5	**Electronic Mail Security** Pretty good privacy: Notation, Operational description S/MIME:RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages Domain keys identified mail: Internet Mail Architecture, E-Mail threats, DKIM strategy, DKIM functional flow Text Book : Chapter-17:1,2,3 **IP Security** IP Security overview: Applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes IP Security policy: Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating Security payload: ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes Combining security associations: Authentication plus confidentiality, basic combinations of security associations, Internet key exchange:key determinations protocol, header and payload formats Text Book : Chapter-18: 1,2,3,4,5	**12**

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar& group activity is evaluated for 10 marks

Course Outcomes:
After the completion of the course students will be able to
CO1: Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
CO2: Identify the security issues in the network and resolve it.
CO3:Apply key management and distribution techniques .
CO4: Analyze security mechanisms at various layers of network model.

COs	Mapping with PO's
CO1	PO1,PO2,PO3,PO4
CO2	PO1,PO2,PO3,PO4
CO3	PO1,PO2,PO3,PO4,PO5
CO4	PO1,PO2,PO3,PO4,PO5

TEXT BOOK : BOOKS:
1. William Stallings: Cryptography and Network Security Principles and Practice, Pearson 6th edition. 2013

REFERENCE BOOKS / WEBLINKS:
1. V K Pachghare: Cryptography and Information Security, PHE ,2013.

Course Title : CLOUD COMPUTING		
Course Code: 20SCN14	**No. of Credits: 3=3: 0 : 0 (L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3hours	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 52**

Course Objective:

- To study the fundamental characteristics, architecture and the different service models of Cloud Computing.
- To learn the Virtualization concepts and technologies used in Cloud Computing.
- To gain the knowledge of managing and securing the Cloud.
- To impart the concept of Service Oriented Architecture.
- To learn and work with the applications of different Cloud Services.

Unit No	**Syllabus**	**No of Hours**
1	Defining Cloud Computing, Cloud Types, Examining the Characteristics of Cloud Computing, Assessing the Role of Open Standards. Understanding Cloud Architecture-Exploring the Cloud Computing Stack, Understanding Services and Applications by Type -Defining Infrastructure as a Service (IaaS), Defining Platform as a Service (PaaS), Defining Software as a Service (SaaS). TB-Chapter 1,2,3,4	10
2	Understanding Abstraction and Virtualization-Using Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Understanding Machine Imaging, Porting Applications Capacity Planning, Defining Baseline and Metrics, Network Capacity, Scaling TB-Chapter 5,6	10
3	Managing the Cloud-Administrating the Clouds, Cloud Management Products, Emerging Cloud Management Standards. Understanding Cloud Security-Securing the Cloud, Securing Data, Establishing Identity and Presence. TB-Chapter 11,12	10
4	Understanding Service Oriented Architecture-Introducing Service Oriented Architecture, Defining SOA Communications, Managing and Monitoring SOA, Relating SOA and Cloud Computing. Moving Applications to the Cloud, Applications in the Clouds, Applications and Cloud APIs. Working with Cloud-Based Storage - Measuring the Digital Universe,	12

	Provisioning Cloud Storage, Exploring Cloud Backup Solutions, Cloud Storage Interoperability. TB-Chapter 13,14,15	
5	Using Google Web Services, Exploring Google Applications, Surveying the Google Application Portfolio, Exploring the Google Toolkit, Working with the Google App Engine Using Amazon Web Services, Understanding Amazon Web Services, Amazon Web Service Components and Services, Working with the Elastic Compute Cloud (EC2), Working with Amazon Storage Systems, Understanding Amazon Database Services Using Microsoft Cloud Services, Exploring Microsoft Cloud Services, Defining the Windows Azure Platform, Using Windows Live TB-Chapter 8,9,10	10

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar is evaluated for 10 marks

Course Outcome:

Students will be able to:
CO1: Analyze and Identify the architecture, infrastructure and delivery models of cloud computing
CO2: Identify and apply the suitable virtualization concepts.
CO3: To analyze & implement the security, management and administration of Cloud.
CO4: Address the core issues of cloud computing such as Managing SOA and Moving Applications to the cloud.
CO5: Analyze systems, protocols and mechanisms to develop and host applications on the Cloud.

Cos	Mapping with POs
CO1	PO1,PO2,PO3, PO4
CO2	PO3, PO4, PO5, PO7,PO9
CO3	PO4, PO5, PO6, PO8, PO9,PO10,PO11,PO12
CO4	PO4, PO5, PO9, PO10
CO5	PO6, PO7, PO8, PO11, PO12

Text Books:
1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2011.

Reference Books:

1. Dan C Marinescu: Cloud Computing Theory and Practice Elsevier(MK) 2013.
2. Rajkumar Buyya , James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey 2014.
3. John W Rittinghouse, James F Ransome:Cloud Computing Implementation, Management and Security, CRC Press 2013.

Course Title : COMPUTER NETWORKS AND CNS LABORATORY		
CourseCode: 20SCNL16	**No. of Credits:2= 0:0: 2.0 (L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hours	**CIE + SEE = 50 + 50 =100**	

Course objectives:

1. To learn Concepts of fundamental protocols.
2. To acquire knowledge of implementation concepts in error detections.
3. To understand the fundamentals of Cryptography through practical implementation.
4. To implement standard algorithms used to provide confidentiality and integrity.

Implement the following using C/C++ /JAVA or equivalent with LINUX/Windows environment:

1. Write a program to transfer the contents of a requested file from Server to the Client using TCP/IP Sockets.

2. Implement Distance Vector Routing algorithm.

3. Write a program for implementing the Error Detection Technique while data transfer in unreliable network code using CRC (16-bits) Technique.

4. Write a program to implement Caesar substitution cipher .

5. Write a program to implement rail fence transposition cipher .

6. Write a program to implement vegener polyalphabetic cipher.

7. Write a program to implement RSA encryption and decryption algorithms .

8. Write a program to implement Diffie-Hellman Key Exchange algorithm.

9. Consider an alphanumeric data, encrypt and Decrypt the data using advanced encryption standards and verify for the correctness.

10. Implement secure hash algorithm for Data Integrity. Implement MD5 and SHA-1 algorithm, which accepts a string input, and produce a fixed size number -128 bits for MD5; 160 bits for SHA-1, this number is a hash of the input. Show that a small change in the input results in a substantial change in the output.

Simulation Programs using OPNET /NS2/NS3/NCTUNS/Packet Tracer or any other equivalent software

11. Simulate a 3 node point to point network with duplex links between them. Set the Queue size and vary the bandwidth and find the number of packets dropped.

12. Simulate a four node point-to-point network with the links connected as follows: n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.

Note: In the examination the student has to answer one question from a lot of 12 questions.

Course Outcomes:
After completing the course the students are able to:
CO1: Design client server applications using socket programming API.
CO2: Implement routing , error detection algorithms.
CO3: Analyze the network performance based on simulation results .
CO4: Design and implement ciphers.

COs	**Mapping with POs**
CO1	PO2, PO3
CO2	PO2, PO3,PO4
CO3	PO2, PO3,PO4
CO4	PO2, PO3,PO4

Course Title : Technical Seminar		
CourseCode: 20SCNS17	**No. of Credits:2=0: 2:0 (L-T-P)**	**No. of lecture hours/week : 2**
Exam Duration : 3 hours	**CIE = 50**	

Course Title : Mini Project/Industry Visit/Field Work		
CourseCode: 20SCNM18	**No. of Credits:2=0:0:6 (L-T-P)**	**No. of lecture hours/week : 6**
Exam Duration : 3 hours	**CIE = 50**	

ELECTIVE I

Sub Title : WIRELESS AD-HOC NETWORKS		
Sub Code:20SCN151	**No. of Credits: 3=3:0:0(L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE +Assignment + SEE = 50+50=100**	**Total No. of Contact Hours :52**

Course objectives:

The objectives of this course are to:

1. Overview of Ad-hoc Networks
2. To gain Knowledge of Ad-hoc network protocols
3. To be aware of current and emerging trends in Ad-hoc Wireless Networks.
4. To aquire knowledge of energy management in ad-hoc wireless networks.

UNIT No	Syllabus Content	No of Hours
1	**Ad-hoc Wireless Networks** : Introduction, Issues in Ad-hoc Wireless Networks, Adhoc Wireless Internet. **MAC Protocols for Ad-hoc Wireless Networks**: Introduction, Issues in Designing a MAC Protocol, Design Goals of MAC Protocols, Classification of MAC protocols, Contention-Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention-Based Protocols with Scheduling Mechanisms, MAC Protocols that Use Directional Antennas. Chapter 5.1-5.3,6.1-6.8	**11**
2	**Routing Protocols for Ad-hoc Wireless Networks**: Introduction, Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks, Classification of Routing Protocols: Table Driven Routing Protocols, On-Demand Routing Protocols, Hybrid Routing Protocols, Hierarchical Routing Protocols and Power-Aware Routing Protocols. Chapter 7.1-7.9	**11**
3	**Multicast Routing in Ad-hoc Wireless Networks:** Introduction, Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An Architecture Reference Model for Multicast Routing Protocols, Classifications of Multicast Routing Protocols, Tree-Based Multicast Routing Protocols and Mesh-Based Multicast Routing Protocols. Chapter8.1-8.7	**10**

4	**Transport Layer and Security Protocols for Ad-hoc Networks:** Introduction, Issues in Designing a Transport Layer Protocol, Design Goals of a Transport Layer Protocol, Classification of Transport Layer Solutions, TCP over Transport Layer Solutions. **Security in Ad-hoc Wireless Networks**: Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management and Secure routing Ad-hoc Wireless Networks. Chapter 9.1-9.5,9.7-9.12	**10**
5	**Quality of Service and Energy Management in Ad-hoc Wireless Networks:** Introduction, Issues and Challenges in Providing QoS in Ad-hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions. **Energy Management in Ad-hoc Wireless Networks**: Introduction, Need for Energy Management in Ad-hoc Wireless Networks, Classification of Energy Management Schemes, Battery Management Schemes, Transmission Management Schemes, System Power Management Schemes. Chapter 10.1-10.4,11.1-11.6	**10**

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3: Note 3:Subject Seminar& group activity is evaluated for 10 marks

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

CO1:Design wireless network
CO2:Implement the different routing protocols.
CO3:Choose appropriate protocol for various applications
CO4:Identify security issues present at different level
CO5:Analyze energy consumption and improve system power

COs	Mapping with POs
CO1	PO1,PO2,PO3,PO4,PO11
CO2	PO1,PO2,PO3,PO4,PO5,PO6,PO8
CO3	PO1,PO2,PO3,PO4,PO6,PO8
CO4	PO1,PO2,PO3,PO10,PO11
CO5	PO1,PO2,PO3,PO6,PO9,PO11

TEXT BOOK:

1. C. Siva Ram Murthy & B. S. Manoj: Ad-hoc Wireless Networks, 2nd Edition, Pearson Education, 2011

REFERENCE BOOKS/WEBLINKS:

1. Srikanta Patnaik and Xiaolong Li: Recent Development in Wireless Sensor and Ad-hoc Networks Springer, 2015.
2. C.K. Toh: Ad-hoc Mobile Wireless Networks- Protocols and Systems, Pearson Education, 2015.

Course Title : INTERNET OF THINGS		
CourseCode:20SCN152	**No. of Credits:3=3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE= 50+50 =100**	**Total No. of Contact Hours :52**

Course Objectives

1. Assess the genesis and impact of IoT applications, architectures in the real world.
2. To Understand the key Technologies and protocols in IoT
3. To Analyze various Layers connectivity and motivation of IPV6
4. To Illustrate the role of IoT in various domains of Industry
5. Infer the role of Data Analytics in IOT

UNIT No	Syllabus Content	No of Hours
1	What is The Internet of Things? Overview and Motivations, Examples of Applications, IPV6 Role, Areas of Development and Standardization, Scope of the Present Investigation. Internet of Things Definitions and frameworks-IoT Definitions, IoT Frameworks, Basic Nodal Capabilities. Internet of Things Application Examples-Overview, Smart Metering/Advanced Metering Infrastructure-Health/Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards, Tracking. **TEXT BOOK 2 :Chapter1-1.1,1.2,1.3,1.4,1.5 Chapter2-2.1,2.2,2.3 Chapter3-3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8**	**12**
2	**Fundamental IoT**Mechanism and Key Technologies-Identification of IoT Object and Services, Structural Aspects of the IoT, Key IoT Technologies. Evolving IoT Standards-Overview and Approaches,IETF IPV6 Routing Protocol for RPL Roll, Constrained Application Protocol, Representational State Transfer, ETSI M2M,Third Generation Partnership Project Service Requirements for Machine-Type Communications, CENELEC, IETF IPv6 Over Lowpower WPAN, Zigbee IP(ZIP) **TEXT BOOK 2: Chapter4-4.1,4.2,4.3 Chapter5-5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9**	**10**
3	**Layer ½ Connectivity**: Wireless Technologies for the IoT-WPAN Technologies for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M,Layer 3 Connectivity :IPv6 Technologies for the IoT: Overview and Motivations. Address Capabilities,IPv6 Protocol Overview, IPv6 Tunneling, IPsec in IPv6,Header	**10**

	Compression Schemes, Quality of Service in IPv6,Migration Strategies to IPv6. **TEXT BOOK 2: Chapter6-6.1,6.2, Chapter7-7.1,7.2,7.3,7.4,7.5**	
4	**Case Studies** illustrating IoT Design-Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications. **TEXT BOOK 1:Chapter 9-9.1,9.2,9.3,9.4,9.5,9.6**	**10**
5	**Data Analytics for IoT**– Introduction, Apache Hadoop, Using Hadoop MapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis, Structural Health Monitoring . **TEXT BOOK 1:Chapter 10-10.1,10.2,10.3,10.4,10.5,10.6,10.7,10.8**	**10**

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar & group activity is evaluated for 10 marks

Course outcomes:
Upon completion of the course, the students will be able to
CO1:Interpret the impact and challenges posed by IoT networks leading to new architectural models.
CO2: Appraise the role of IoT protocols for efficient network communication
CO3: Deployment of different sensor technologies and Layers to connect the network.
CO4: To Deploy the role of IoT design in various domains of Industry
CO5:Elaborate the need for Data Analytics .

COs	Mapping with PO's
CO1	PO3,PO4,PO5,PO6,PO9,PO10
CO2	PO3,PO4,PO5,PO6,PO7,PO9,PO10
CO3	PO4,PO6,PO7,PO9,PO11
CO4	PO4,PO5,PO6, PO8,PO9,PO10,PO11,PO12
CO5	PO4,PO5,PO6,PO7,PO9,PO10

TEXT BOOK:

1. ArshdeepBahga, Vijay Madisetti, ”Internet of Things : A Hands on Approach” Universities Press., 2015
2. Daniel Minoli, ”Building the Internet of Things with IPv6 and MIPv6:The Evolving World of M2M Communications”, Wiley, 2013

REFERENCE BOOKS/WEBLINKS

1.Michael Miller,” The Internet of Things”, First Edition, Pearson, 2015.

2.Claire Rowland,Elizabeth Goodman et.al.,” Designing Connected Products”, First Edition,O’Reilly, 2015

Course Title : TRENDS IN ARTIFICIAL INTELLIGENCE AND SOFT COMPUTING		
CourseCode:20SCN153	**No. of Credits:3=3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE= 50+50 =100**	**Total No. of Contact Hours :52**

Course Objectives

1. Describe Artificial Intelligence ,its utility and intelligent agents
2. Use and implement search techniques
3. Use knowledge representation techniques for problem solving
4. Describe and apply Fuzzy systems to various problem domains
5. Describe and apply GA to different problem domains

UNIT No	Syllabus Content	No of Hours
1	Role of AI in Engineering, AI in daily life, Intelligence and AI, Different Task Domains of AI, History and Early Works of AI, History of AI, Programming Methods, Limitaions of Ai, Agent, Performance Evaluation, Task environment of an Agent, Agents Classification, Agent Architecture Logic Programming, Logic Representation, Propositional Logic, Predicate Logic and Predicate Calculus, Horn Clauses, Well formd Formula, Computable functions and predicate, Quantifiers, Universe of discourse, Applications of Predicate Logic, Unification, Resolution, Conjuctive Normal Form, conversion to normal form or clausal form .**Text1:Ch1,Ch2,Ch3**	**10**
2	Fundamental Problem of Logic: Logic Inadequacy: Fundamental Problem of Logic- Monotonicity wuith "Flying Penguin" example, General disadvantage of monotonicity property in logic , logic in search space problem, logic in decidability and Incompleteness, Logic in Uncertainty Modelling, Knowledge representation: Knowledge, Need to represent knowledge, Knowledge representation with mapping scheme, properties of a good knowledge base system, Knowledge representation issues, AND-OR graphs, Types of knowledge, Knowledge representation schemes, , semantic nets, Frames, conceptual graphs, conceptual dependence theory, script, weak and strong slot filler. Reasoning: Types of Reasoning, Methods of reasoning, Application of Reasoning, Forward and Backward Reasoning **Text1:Ch4,Ch6,Ch7.1-7.4**	**12**
3	Search Techniques: Search, Representation techniques, Categories of Search, Disadvantage of state space search, Issues in design of search programs, General Search examples, Classification of search diagram representation, Hill climbing method and Hill climbing search ,Simulates Annealing, Best-First Search, Branch and Bound Search, A search Game	**10**

	Playing: Two player games, Minmax Search, Complexity of Minmax algorithm, Alpha-Beta Pruning Planning: Necessity of planning, Components of Planning, Planning Agents, Plan- gererating schemes, Algorithm for planning, Planning Representation with STRIPS, BlOCKS WORLD, difficulties with planning. **Text1:Ch8,Ch9,Ch10,Ch11**	
4	Fuzzy Sets and Uncertainties: Fuzzy set and fuzzy logic, set and fuzzy operators, , Extended fuzzy operations, Fuzzy relations, Properties of fuzzy relations, Fuzzy system and design, Linguistic hedges, Syntax for IF and Then rules, , Types of fuzzy rule based system, Fuzzy linguistic controller, Fuzzy Inference, Graphical techniques of Inference, How, Fuzzy logic is used, Fuzzification, De-fuzzification. Unique features of Fuzzy Logic, Application of Fuzzy Logic, Fuzzy logic uncertainty and probability, Advantages and Limitations of Fuzzy logic and Fuzzy Systems.**Text1:Ch5**	**10**
5	Advancement of AI: Expert System, Expert System structure, Knowledge acquisition,Knowledge representation, Inference control mechanism, User interface, Expert System Shell, Knowledge Representation, Inference Mechanism, Developer Interface and User Interface, Characteristics of Expert system, Advantages of an expert system, Production System, Artificial Neural Networks, : Characteristics of Neural Networks, Architecture of neural networks, Types of neural networks, Application of neural networks. **Text1:Ch12**	**10**

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar is evaluated for 10 marks

Course Outcomes:
CO1:Design intelligent agents for problem solving, reasoning, planning, decision making, and learning.
CO2:Apply AI technique to current applications.
CO3:Apply Problem solving, knowledge representation, reasoning, and learning techniques to solve real world problems
CO4:Design and build expert systems for various application domains.
CO5:Apply Soft Computing techniques such as neural networks, fuzzy logic to solve problems in various application domains

COs	Mapping with PO's
CO1	PO1,PO2,PO3
CO2	PO1,PO2,PO3
CO3	PO1,PO2,PO3
CO4	PO2,PO3,PO4
CO5	PO2,PO3,PO4

Text Books:

1. Anindita Das Battacharjee, Artificial Intelligence and Soft computing for Beginners, Shroff Publishers, 2nd edition

REFERENCE BOOKS/WEBLINKS

1. Elaine Rich,Kevin Knight, Shivashanka B Nair:Artificial Intelligence, Tata CGraw Hill 3rd edition 2013.
2. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, Pearson 3rd edition.
3. Neural Networks, Fuzzy Logic and Genetic Algorithms by S. Rajasekaran, G. A. Vijayalakshmi Pai PHI publication
4. Nils J. Nilsson: "Principles of Artificial Intelligence", Elsevier, ISBN-13: 9780934613101

Sub Title : ADVANCES IN STORAGE AREA NETWORKS		
Sub Code: 20SCN154	**No. of Credits:3=3 : 0 : 0 (L-T-P)**	**No. of Lecture Hours/Week : 4**
Exam Duration : 3 hours	**Exam Marks :CIE +Assignment + SEE = 45 + 5 + 50 =100**	**Total No. of Contact Hours : 52**

Course Objectives:

1. To understand the fundamentals of storage architecture along with storage virtualization.
2. To understand the metrics used for designing storage area networks.
3. To enable the students to understand RAID concepts.
4. To appreciate the use of cables technologies used in SAN technology.

Unit No.	Syllabus Content	No. of Hours
1	**Introduction:** Server Centric IT Architecture and its Limitations; Storage – Centric IT Architecture and its advantages. Case study: Replacing a server with Storage Networks The Data Storage and Data Access problem; The Battle for size and access. Intelligent Disk Subsystems: Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels; JBOD, Storage virtualization using RAID and different RAID levels; Caching: Acceleration of Hard Disk Access; Intelligent disk subsystems, Availability of disk subsystems. **Sections: 1.1-1.3, 2.1-2.8**	12
2	**I/O Techniques:** The Physical I/O path from the CPU to the Storage System; SCSI; Fiber Channel Protocol Stack; Fibre Channel SAN; IP Storage. Network Attached Storage: The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system. File System and NAS: Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS. **Sections: 3.1-3.5, 4.1-4.5**	10
3	**Storage Virtualization:** Definition of Storage virtualization ; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network. **Sections: 5.3-5.7**	10
4	**Applications of Storage Network:** Definition of the Term 'Storage Network', Storage Sharing, Availability of Data, Adaptability and Scalability of IT Systems, General Conditions for Backup Network Backup Services Components of Backup Servers, Backup clients **Sections: 6.1-6.4, 7.1-7.4**	10
5	**Management of Storage Network:** System Management, Requirement of	10

	management System, Support by Management System, Management Interface, Standardized Mechanisms, Property Mechanisms, In-band Management, out-of-band management. **Sections: 10.1-10.4**	

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar & group activity is evaluated for 10 marks

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

CO1: Identify the need for storage networks and its advantages.
CO2: Recognize various RAID levels.
CO3: Apply the concept of storage virtualization and recognize steps for Business continuity planning in an Enterprise.
CO4: Analyze SAN architecture along with the use of cables technologies.
CO5: Realize the concept of management of storage network.

COs	**Mapping with POs**
CO1	PO1, PO2, PO12
CO2	PO1, PO2
CO3	PO1,PO2,PO11
CO4	PO1,PO2,PO12
CO5	PO1, PO2,PO11, PO12

TEXT BOOKS:

1. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2013.

REFERENCE BOOKS/WEB LINKS:

1.Robert Spalding: "Storage Networks The Complete Reference", Tata McGraw-Hill, 2011.
2. Marc Farley: Storage Networking Fundamentals – An Introduction to Storage Devices, Subsystems, Applications, Management, and File Systems, Cisco Press, 2005.
3. Richard Barker and Paul Massiglia: "Storage Area Network Essentials A CompleteGuide to understanding and Implementing SANs", Wiley India, 2006

I SEMESTER

Course Title: BIG DATA & ANALYTICS		
Course code:20SCN21	**No. of Credits:3=3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours:52**

Course Objectives:

- Understand Big data for industry applications.
- Analyze business case studies for Big data analytics
- Define managing of Big data without SQL
- Develop Mapreduce analytics using Hadoop and related tools.

UNIT No.	Syllabus Content	No. of Hours
1	**NOSQL DATA MANAGEMENT:**Introduction to NoSQL–Aggregate datamodels–Aggregates–Key-value and Document datamodels–Relationships–Graph databases–Schemaless databases–Materialized views–Distribution models–Sharding—Version–Mapreduce–Partitioning and combining –Composing Mapreduce calculations. Text2: Chapter1.1-1.5, 2.1-2.4, 3.1-3.5	**10**
2	**UNDERSTANDING BIG DATA:** What is Bigdata–Why Bigdata-DataStorage and Analysis, Comparison with Other Systems, Rational Database Management System **BASICSOFHADOOP:**Dataformat–Analyzing data with Hadoop–Scalingout–Hadoop streaming–Hadoop pipes–Design of Hadoop distributed filesystem(HDFS)–HDFS concepts–Java interface–Dataflow–HadoopI/O–Data integrity–Compression –Serialization–Avro–File-based data structures. Text1: Chapter 1.1-1.4, 2.1-2.4,	**11**
3	**MAPREDUCEAPPLICATIONS**:MapReduceworkflows–Unit tests with MRUnit–Testdata and local tests–Anatomy of MapReduce jobrun–Classic Map-reduce–YARN–Failures in classic Mapreduce and YARN–Job scheduling–Shuffle and sort–Task execution–MapReduce types–Inputformats–Outputformats. Text1: Chapter 3.1-3.5, 6.1-6.4, 7.1-7.5	**10**
4	**HADOOP RELATEDTOOLS-I:** Hbase–Datamodel and implementations–Hbase clients–Hbase examples–Praxis; Cassandra–Cassandra data model–Cassandra examples– Cassandra clients–Hadoop integration; Pig–Grunt–Pig datamodel– PigLatin– Developing and testing PigLatin scripts; Hive–Datatypes and fileformats–HiveQL datadefinition–HiveQL datamanipulation– HiveQLqueries. Text1: Chapter 20.1-20.3, 16.1-16.4, 17.1-17.5	**11**
5	**HADOOP RELATEDTOOLS-II:** ZooKeeper about, building applications,	

	configuration service, Lock Service Implementation distributed data structures and protocols, More Distributed Data Structures and Protocols resilient, The Resilient ZooKeeper service consistency,Consistency data modelGroup failover controllers and Failover and fencing. Spark about anatomy of job runs, Anatomy of a Spark Job, Run–Task Execution cluster managers and, Executorsand Cluster Managers Python Example ,Hive and, Execution engines installing, Installing Spark MapReduce and, Transformations and Actions RDDs and, Resilient Distributed Datasets–Functions resource requests, Resource Requests shared variables, Shared Variables–Accumulators sorting data, Total Sort YARN and, Spark on YARN–YARNcluster mode. Text1: Chapter 21.1-21.4, 19.1-19.4	**10**

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar & group activity is evaluated for 10 marks

Course Outcomes:

After completing the course the students are able to:

CO1: Describe Big data and use cases from selected industry domains.

CO2: Discuss about NoSQL Big data management**.**

CO3: Install, configure, and run Hadoop.

CO4: Perform Mapreduce analytics using Hadoop.

CO5: Use Hadoop related tools such as HBase, Cassandra, Pig and Hive for Big Data Analytics.

COs	**Mapping with PO's**
CO1	PO2, PO8
CO2	PO4,PO5, PO8
CO3	PO3, PO4, PO5
CO4	PO4, PO5
CO5	PO3, PO4, PO5, PO11.

TEXT BOOKS:

1. Tom White,"Hadoop:TheDefinitiveGuide",ThirdEdition,O'Reilley,2012.
2. Pramod J. Sadalage, Martin Fowler, "NoSQL Distilled", Pearson Education, ISBN-13: 978-0-321-82662-6, 2013.

REFERENCE BOOKS:

1. Tom White,"Hadoop:TheDefinitiveGuide",ThirdEdition,O'Reilley,2012.
2. Big Data, Black Book- DT Editorial Services Wiley Publications 2ed.
3. EricSammer,"HadoopOperations",O'Reilley,2012.

Course Title: NETWORK MANAGEMENT		
Course code:20SCN22	**No. of Credits:3=3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours :52**

Course Objectives

- To Understand the Anology, Issues and challenges pertaining to management of emerging network technologies .
- To learn the concepts and architecture behind standards based network management.
- To familiarize the concepts and terminology associated with SNMP and TMN.
- To Understand the various broad band networks for managing OSI network model.
- To study network management as a typical distributed application..

UNIT No	Syllabus Content	No of Hours
1	**Introduction:** Analogy of Telephone Network Management, Data and Telecommunication Network Distributed computing Environments, TCP/IP- Based Networks: The Internet and Intranets, Communications Protocols and Standards, Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions- Goal of Network Management, Network Provisioning, Network Operations and the NOC, Network installation and Maintenance;Network Management System platform, Current Status and Future of Network Management. **Text book 1:Chapter1-1.1,1.2,1.3,1.4,1.5,1.8,1.9, 1.12,1.13**	**10**
2	**Basic Foundations: Standards, Models, and Language:** Network Management Standards, Network Management Model, Organization Model, Information Model – Management Information Trees, Managed Object Perspectives, Communication Model; ASN.1-Terminology, Symbols, and Conventions, Objects and Data Types, Object Names, An Example of ASN.1 from ISO 8824; Encoding Structure; Macros, Functional Model. **Text book 1:Chapter3-3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.8,3.9**	**10**
3	**SNMPv1 Network Management:** Managed Network: The History of SNMP Management, Internet Organizations and standards, The SNMP Model, The Organization Model, System Overview. The Information	

	Model The SNMP Communication Model – Functional Model. **SNMP Management – RMON:** Remote Monitoring, RMON SMI and MIB, RMONI1, RMON2. **Text book 1:Chapter4-4.1,4.2,4.3,4.4,4.5,4.6,4.7 Chapter5-5.1,5.2 Chapter8-8.1,8.2,8.3,8.4**	**12**
4	**Broadband Network Management:Wired and optical Access networks-**Broadband Access Networks,Broadband Access Technology; The Cable Modem Technology,Cable Access Network management DSL Access Network, Asymmetric Digital Subscriber Line ADSL Management – ADSL Network Management Elements, ADSL Configuration Management, ADSL Fault Management, ADSL Performance Management, SNMP-Based ADSL Line MIB, MIB Integration with Interfaces Groups in MIB-2, ADSL Configuration Profiles. **Text book 1:Chapter13-13.1,13.2,13.3,13.4,13.5,13.6,13.7, 13.8**	**10**
5	**Network Management Applications:** Configuration Management-Network Provisioning, Inventory Management, Network Topology, Fault Management- Fault Detection, Fault Location and Isolation Techniques, Performance Management – Performance Metrics, Data Monitoring, Problem Isolation, Performance Statistics; Event Correlation Techniques – Rule-Based Reasoning, Model-Based Reasoning, Case-Based Reasoning, Codebook correlation Model, State Transition Graph Model, Finite State Machine Model, Security Management – Policies and Procedures, Security Brea ches and the Resources Needed to Prevent Them, Firewalls, Cryptography, Authentication and Authorization, Client/Server Authentication Systems, Messages Transfer Security, Protection of Networks from Virus Attacks, Accounting Management, Report Management, Policy- Based Management, Service Level Management. **Text book 1:Chapter11-11.1,11.2,11.3,11.4,11.5,11.6,11.7,11.8, 11.9**	**10**

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar & group activity is evaluated for 10 marks

Course Outcomes:
After completing the course the students are able to:.

CO1: Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets

CO2: Apply network management standards to manage practical networks.

CO3 : Infer RMON for monitoring the behavior of the network Identify the various components of network

CO4: Formulate the possible broadband network for managing OSI network model.

CO5: Implement SNMP for managing the network.

Cos	Mapping with PO's
CO1	PO3,PO4,PO6,PO7,
CO2	PO2,PO3,PO4,PO5
CO3	PO2,PO4,PO5,PO8,PO9,
CO4	PO3,PO5,PO6,PO8,PO9,PO10,PO11
CO5	PO3,PO5,PO6,PO9,PO10,PO11,PO12

TEXT BOOK:

1. Mani Subramanian: Network Management- Principles and Practice, 2nd Pearson Education, 2010.

REFERENCE BOOKS/WEBLINKS:

1. J. Richard Burke: Network management Concepts and Practices: a Hands-On Approach, PHI, 2008.

Course Title: PYTHON PROGRAMMING		
Course code:20SCN23	**No. of Credits:3=3 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours :52**

Course Objectives

- Understanding the syntax and semantics of the Python language.
- To create Functions in Python.
- To handle Files & Regular expressions in Python.
- To apply Object Oriented Programming concepts in Python.
- To create Threaded and Networking applications in Python

UNIT No	Syllabus Content	No of Hours
1	**Introduction:** History of Python, Need of Python Programming, Applications, Basics of Python Programming, Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. Data Types - Integers, Strings, Booleans; **Operators and Expressions:** Operators- Arithmetic Operators, Relational Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations. **Data Structures:** Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions. **Text1:Ch1,Ch2,Ch3,Ch4**	**10**
2	**Control Flow** - if, if-elif-else, for, while, break, continue, pass. **Functions** - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions, Scope of the Variables in a Function - Global and Local Variables. **Modules**: Creating modules, import statement, from .import statement, name spacing, **Python packages**, Introduction to PIP, Installing Packages via PIP, Using Python Packages**. Error and Exceptions:** Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions. **Files in Python**:Types of files, Working with Text files, Working with Binary Files, Pickle Module. **Text1:Ch5,Ch6,Ch7,Ch8**	**10**
3	**Brief Tour of the Standard Library** - Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Data Compression. **Date and Time:** The Epoch, Date and Time Now, Combining date and time, Formatting date and Time, Comparing Two Dates, Working with Calendar Module. .**Object Oriented**	**10**

	Programming in Python: Creating a class, The Self Variable, Namespaces, Types of Methods, Inner classes Inheritance and Polymorphism: Constructors in Inheritance, The Super() Method, Types of Inheritance: Single/Multiple, Method Resolution order, Polymorphism, Operator Overloading, Method overloading, Method Overriding. **Text1:Ch9,Ch10,Ch12,Ch13**	
4	**Regular Expressions in Python:** Sequence Characters in Regular Expressions, Quantifiers in Regular Expressions, Special Characters in Regular Expressions, Using Regular Expressions in a File, Retrieving Information from HTML File. **Data Structures in Python:** Linked Lists, Stacks, Queues, Deques. **Threads**: Creating Threads in Python, Thread class Methods, Thread Synchronization, Communication between Threads, Daemon Threads. **Text1:Ch14,Ch15,Ch16,Ch17**	**10**
5	**Networking in Python**: Sockets, Reading the source code of Web Page, A TCP/IP Server and Client, A UDP Server and Client, A File Server and Client, Graphical User Interface, **Python's Database Connectivity:** Working With MySQL Database, Using MySQL from Python, Retrieving all rows from a table, Inserting, deleting, updating table, Creating Data base tables through python, **Graphical User Interface:** The Root Window, Canvas, Frame, Widgets, Button Widget ,Label Widget, Message Widget, Text Widget, Menu Widget. **Text1:Ch18,Ch19,Ch20,Ch21.**	**12**

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar is evaluated for 10 marks

Course Outcomes:
After completing the course the students are able to:.
CO1: Demonstrate the understanding and usage of core python scripting elements python constructs, data types.
CO2 : Demonstrate the understanding and usage of functions ,lists, tuples and dictionaries.
CO3: Demonstrate the understanding and usage of modules, packages and regular expressions.
CO4: Demonstrate usage of object oriented features such as Inheritance, Polymorphism, operator overloading.
CO5:Apply the knowledge of python and use the language scripting elements and constructs to develop threaded and networking applications.

Cos	Mapping with PO's
CO1	PO1,PO2,PO4
CO2	PO1,PO2,PO4
CO3	PO1,PO2,PO4,PO5,PO8
CO4	PO1,PO2,PO4,PO5,PO8
CO5	PO1,PO2,PO4,PO5,PO8

TEXT BOOK:

1. Core Python Programming: Dr.R.Nageshwara Rao,Dreadm Tech Press 2018

REFERENCE BOOKS/WEBLINKS:

1. Think Python, Allen Downey, Green Tea Press.
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage.
4. Learning Python, Mark Lutz, Orielly

Sub. Title : CYBER LAWS AND ETHICS		
Sub. Code:20SCN24	**No. of Credits: 3 =3:0:0(L-T-P-S)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50+50=100**	**Total No. of Contact Hours : 52**

Course Objectives

- Explain the Indian legal system, ITA 2000/2008, cyber security and related legal issues.
- Explain the Types of contract law, Digital signature and related legal issues, the Intellectual property rights, types of cyber properties, copyright law, patent and related legal issues, the types of cyber crimes and related legal issues
- Explain cyber crime investigation and prosecution in depth

Unit No.	Syllabus	No. of Hours
1	**Legal Aspects of Information Security:** Basic concepts of Law and Information Security, Overview of Information Security Obligations under ITA 2008, Privacy and Data Protection concepts. **Volume 1: 35-212**	**10**
2	**Cyber Contracts:** Law of contracts applicable for Cyber Space Transactions, Legal Recognition of Electronic Documents, Authentication of Electronic Documents, Types of Cyber space Contracts, Resolution of Disputes in Digital Space, Stamping of Contractual Document. **Volume 2: 219-294**	**10**
3	**Intellectual Property Rights in Cyber Space:** Concept of Virtual Assets, An overview of Intellectual Property Rights, Trademarks and Domain Names, Copyright Law, Law of Patents. **Volume 3: 299-427**	**10**
4	**Cyber Crimes:** Law of Cyber Crimes, Types of Cyber Crimes, Provisions of Cyber Crimes under ITA 2008, System Adjudication, Case Studies. **Volume 4: 434-777**	**10**
5	**Miscellaneous Issues:** Miscellaneous Issues, Evidentiary Issues, Jurisdiction Issues, Information Security Management in corporate Sector. **Volume 5: 785-1041**	**12**

Course Outcomes:

At the end of the course, the students will be able to:
CO1: Describe the Indian legal system, ITA 2000/2008, cyber security and related legal issues.
CO2: Classify the Types of contract law, Digital signature , related legal issues, the Intellectual
property rights, types of cyber properties, copyright law, patent and related legal issues, the types of cyber crimes and related legal issues, the types of cyber crimes and related legal issues.
CO3: Interpret the cyber crime investigation and prosecution in depth.

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar & group activity is evaluated for 10 marks

Cos	Mapping with PO's
CO1	PO1,PO2,PO3,PO5
CO2	PO2,PO4,PO5,PO6,PO7
CO3	PO1,PO2,PO3,PO4,PO5,PO6,PO7
CO4	PO1,PO2,PO5,PO7,PO8
CO5	PO1,PO2,PO3,PO9,PO11

Text Books:

1. Cyber Laws for Engineers, Naavi, Ujvala Consultants Pvt Ltd, 2010.

Reference Books:

1. Deborah G Johnson, Computer Ethics, Pearson Education Pub., ISBN : 81-7758-593-2.
2. Earnest A. Kallman, J.P Grillo, Ethical Decision making and Information Technology: An Introduction with Cases, McGraw Hill Pub.
3. John W. Rittinghouse, William M. Hancock, Cyber security Operations Handbook, Elsevier Pub.
4. Michael E. Whitman, Herbert J. Mattord, Principles of Information Security, 2nd Edition, Cengage Learning Pub.
5. Randy Weaver, Dawn Weaver, Network Infrastructure Security, Cengage Learning Pub
6.

Course Title: CLOUD COMPUTING AND BIG DATA ANALYTICS LABORATORY		
Course code:20SCNL26	**No. of Credits:2= :0:0:2(L-T-P)**	**No. of lecture hours/week : 3**
Exam Duration : 3 hours	**CIE + SEE = 50 + 50 =100**	

Course objectives:

1. To study the basic understanding of Installation and Configuration of Cloud environment like OpenStack.
2. To understand the working and usage of different cloud service models.
3. To implement Virtualization using VMWare/Hypervisor.
4. Understand installation of various Big data tools under Hadoop.
5. To apply Hadoop concepts to various applications and NoSQL implementation.

I. LIST OF PROGRAMS

PART A

Cloud Computing Laboratory

1. Demonstrate the working of Google Drive to make spreadsheets and notes.
2. Installation, Configuration and working on Dropbox.
3. Demonstrate the working in Cloudanywhere to develop an application using PaaS.
4. Demonstrate the working of Google Form to develop an Event Feedback System.
5. Creating an application in Salesforce .com for storing Student details.
6. Creating an application in Salesforce.com using master detail relationship for storing student/subject details.
7. Demonstrate Virtualization using VMware/Hypervisor

PART – B

Big Data Analytics Laboratory

Program 1: (HDFS)

1. Review the commands available for the Hadoop Distributed File System:
2. Copy file foo.txt from local disk to the user's directory in HDFS
3. Get a directory listing of the user's home directory in HDFS
4. Get a directory listing of the HDFS root directory
5. Display the contents of the HDFS file user/fred/bar.txt
6. Move that file to the local disk, named as baz.txt
7. Create a directory called input under the user's home directory 8. Delete the directory input old and all its contents
8. Verify the copy by listing the directory contents in HDFS.

Program 2: (MapReduce)

Demonstrate movie rating count based on movieid using MapReduce program.

Program 3: (Hive)
Using movie ratings data, Develop the queries in Hive for the following-
1. List all the movies and the number of ratings
2. List all the users and the number of ratings they have done for a movie
3. List all the Movie IDs which have been rated (Movie Id with at least one user rating it)
4. List all the Users who have rated the movies (Users who have rated at least one movie)
5. List of all the User with the max, min, average ratings they have given against any movie
6. List all the Movies with the max, min, average ratings given by any user.

Program 4: (Hive)
In this program you will use HiveQL to filter and aggregate click data to build facts about the user's movie preferences. The query results will be saved in a staging table used to populate the Oracle Database.

The moveapp_log_json table contains an activity column. Activity states are as follows:
RATE_MOVIE ,COMPLETED_MOVIE , PAUSE_MOVIE , START_MOVIE
BROWSE_MOVIE , LIST_MOVIE, SEARCH_MOVIE, LOGIN , LOGOUT
INCOMPLETE_MOVIE, PURCHASE_MOVIE

a. Write a query to select only those clicks which correspond to starting, browsing, completing, or purchasing movies. Use a CASE statement to transform the RECOMMENDED column into integers where 'Y' is 1 and 'N' is 0. Also, ensure GENREID is not null. Only include the first 25 rows.

b. Write a query to select the customer ID, movie ID, recommended state and most recent rating for each movie.

Program 5:
In this program you will use HiveQL . The moveapp_log_json table contains an activity column. Activity states are as follows: RATE_MOVIE , COMPLETED_MOVIE, PAUSE_MOVIE, START_MOVIE , BROWSE_MOVIE, LIST_MOVIE, SEARCH_MOVIE , LOGIN, LOGOUT, INCOMPLETE_MOVIE.

a. Load the results of the previous two queries into a staging table. First, create the staging table:
b. Next, load the results of the queries into the staging table.

Program 6: (Pig)
1. Start the Grunt shell and execute the following statements to set up a dataflow- Create and insert into MovieRating table. Check the schema of the table created.
2. Sort the records of MovieRating table into a separate table.
3. GROUP the records of MovieRating table into a separate table.
4. Export records of the table into a data file.

Course Outcomes:
After completing the course the students are able to:
CO1: Analyze the problem and build Cloud applications using Services models.
CO2: Design and implement Virtualization Concepts to build Cloud.
CO3: Elucidate installation of various Big data tools.
CO4: Develop applications using Map Reduce.
CO5: Develop applications using Hadoop tools like Hive, Pig.

COs	**Mapping with POs**
CO1	PO1,PO2,PO5,PO7,PO11
CO2	PO1,PO2, PO5, PO7
CO3	PO1,PO5,PO7,PO9
CO4	PO3,PO4,PO5,PO6,PO8,PO9,PO11,PO12
CO5	PO3,PO4,PO5,PO7,PO8,PO11,PO12

Sub. Title :RESEARCH METHODOLOGY		
Sub Code:18RM27	**No. of Credits :2= 0:1:0(L-T-P)**	**No. of lecture hours/week : 02**
Exam Duration : 3 hours	**CIE +SEE = 50+50 =100**	

Sub. Title :Mini Project/Industry Visit/Field Work		
Sub Code:20SCNL28	**No. of Credits :2= 0:0:6(L-T-P)**	**No. of lecture hours/week : 06**
Exam Duration : 3 hours	**CIE = 50**	

ELECTIVE II

Course Title : ARTIFICIAL INTELLIGENT & AGENT TECHNOLOGY		
Course Code: 20SCN251	**No. of Credits: 3=3:0:0:0(L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50+50=100**	**Total No. of Contact Hours : 52**

Course Objectives:

1. To Apply a given AI technique to a given concrete problem
2. To Implement non-trivial AI techniques in a relatively large system
3. To understand uncertainty and Problem solving techniques.
4. To understand various symbolic knowledge representation to specify domains and reasoning tasks of a situated software agent.
5. To understand different logical systems for inference over formal domain representations, and trace how a particular inference algorithm works on a given problem specification.
6. To understand how to write a Prolog Programs for Artificial Intelligence

Unit No	Syllabus Content	No Of Hours
1	What is Artificial Intelligence: The AI Problems, The Underlying assumption, What is an AI Technique?, The Level of the model, Criteria for success, some general references, One final word and beyond. Problems, problem spaces, and search**:** Defining, the problem as a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in the design of search programs, Additional Problems.Intelligent Agents: Agents and Environments, The nature of environments, The structure of agents. (Text Book 1: Chapter 1 & 2 Text Book 2: Chapter 2)	**10**
2	Heuristic search techniques: Generate-and-test, Hill climbing, Best-first search, Problem reduction, Constraint satisfaction, Mean-ends analysis, Knowledge representation issues**:** Representations and mappings, Approaches to knowledge representation, Issues in knowledge	**10**

	representation, The frame problem. Using predicate logic: Representing simple facts in logic, representing instance and ISA relationships, Computable functions and predicates, Resolution, Natural Deduction. Logical Agents: Knowledge –based agents, the Wumpus world, Logic-Propositional logic, Propositional theorem proving, Effective propositional model checking, Agents based on propositional logic. (Text Book 1: Chapter 3, 4 & 5 Text Book 2: Chapter 6 **)**	
3	Symbolic Reasoning Under Uncertainty: Introduction to nonmonotonic reasoning, Logic for nonmonotonic reasoning, Implementation Issues, Augmenting a problem-solver, Implementation: Depth-first search, Implementation: Breadth-first search. Statistical Reasoning: Probability and bayes Theorem, Certainty factors and rule-based systems, Bayesian Networks (Text Book1: Chaoter 7 & 8 Text Book 2: chapter13)	**10**
4	An Overview of Prolog, An example program: defining family relations Extending the example program by rules, A recursive rule definition, How Prolog answers questions, Declarative and procedural meaning of programs Syntax and Meaning of Prolog Programs, Data objects, Matching Declarative meaning of Prolog programs, Procedural meaning Example: monkey and banana Order of clauses and goals Remarks on the relation between Prolog and logic (Text Book3 : Chapter 1 & 2)	**11**
5	List Operators, Arithmatic, Represenation of lists, some operations on lists, Operator notation, Arithmatic, Using structures: Example programs, Retrieving Structured information from a database, Doing Data abstraction, Simulating a non-deterministic automation, Travel Planning, The Eight queens problems, Controlling, Backtracking, preventing backtracking, Examples Using Cut, Negation as failure, Problems with Cut and negation, Input and Output, communication with file (Text Book 3: Chapter 3, 4, 5 & 6)	**11**

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar & group activity is evaluated for 10 marks

COURSE OUTCOMES:

CO1: Design intelligent agents for problem solving, reasoning, planning, decision making, and learning. specific design and performance constraints, and when needed, design variants of existing algorithms.
CO2: Apply AI technique on current applications.
CO3: Problem solving, knowledge representation, reasoning, and learning.
CO4: Demonstrating how to write programs for Artificial Intelligence
CO5: Solving recursive programs in Prolog
CO6: Analyzing and solving Artificial Intelligence programs by using backtracking methods

CO's	Mapping with POs
CO1	PO1, PO2, PO5, PO9
CO2	PO1, PO5, PO11, PO12
CO3	PO1, PO2, PO7, PO9
CO4	PO1, PO2, PO9, PO11
CO5	PO1, PO2, PO11, PO12
CO6	PO1, PO2, PO5, PO11, PO12

Text Books.

(1) Elaine Rich,Kevin Knight, Shivashanka B Nair:Artificial Intelligence, Tata CGraw Hill 3rd edition. 2013, ISBN 10: 0070087709 ISBN 13: 9780070087705

(2) Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, Pearson 3rd edition 2013, ISBN 0-13-604259-7

(3) Ivan Bratko, PROLOG Programming for Artificial Intelligence
Published by Pearson Education (US), 2011 ISBN 10: 0321417461 / ISBN 13: 9780321417466

Reference Books:
1. Nils J. Nilsson: “Principles of Artificial Intelligence”, Elsevier, ISBN-13: 9780934613101

Sub. Title : DIGITAL IMAGE PROCESSING		
Sub.Code: 20SCN252	**No. of Credits: 3 =3:0:0(L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50+50=100**	**Total No. of Contact Hours : 50**

Course objectives:

The objectives of the course are :

1. To overview of Digital image processing
2. To gain knowledge of image enhancement.
3. To be aware of image restoration techniques.
4. To acquire knowledge of colour fundamentals and morphological image processing.

Unit No.	Syllabus	No. of Hours
1	Introduction: What is Digital Image Processing, Origins of Digital Image Processing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System. Digital Image Fundamentals: Basic Concepts in Sampling and Quantization, Representing Digital Images, Spatial and Gray-level Resolution,Some Basic Relationships Between Pixels, Linear and Nonlinear Operations.	**10**
2	Image Enhancement in the Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters. Image Enhancement in the Frequency Domain: Introduction to the Fourier Transform and the Frequency Domain, Smoothing frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphic Filtering.	**10**
3	Image Restoration: A Model of the Image degradation/Restoration process, Noise Models, Restoration in the Presence of Noise Only–Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering ,Minimum Mean Square Error (Wiener) Filtering, Constrained Least Square Filtering, Geometric Mean Filter.	**11**
4	Color Fundamentals: Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation,Color Image Compression. Wavelets and Multiresolution Processing: Image Pyramids, Subband coding, The Haar Transform, Multiresolution Expansions, Wavelet Transforms in one Dimension, Fast Wavelet Transform, Wavelet Transforms in Two Dimensions, Wavelet Packets.	**10**

5	Image Compression: Fundamentals, Image Compression Models, Error-free (Lossless) compression, Lossy Compression Morphological Image Processing: Preliminaries, Dilation and Erosion, Opening and Closing, The Hit-or-Miss Transformation, Some Basic Morphological Algorithms. Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation.	**11**

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar & group activity is evaluated for 10 marks

Course Outcomes:
At the end of the course, the students will be able to:
CO1:understand image processing concepts.
CO2: Analyze image enhancement techniques.
CO3:Choose image restoration applications.
CO4:Identify color fundamentals and its transformations.
CO5:Analyze morphological image concepts

Text Books: 1. Rafael C Gonzalez and Richard E. Woods: Digital Image Processing, PHI 2nd Edition 2005

Reference Books:
1. S. Sridhar, Digital Image Processing, Oxford University Press India, 2011.
2. K. Jain: Fundamentals of Digital Image Processing, Pearson, 2004.
3. Scott E. Umbaugh: Digital Image Processing and Analysis, CRC Press, 2014.
4. S. Jayaraman, S. Esakkirajan, T. Veerakumar: Digital Image Processing, McGraw Hill Ed. (India) Pvt. Ltd., 2013.
5. Anthony Scime, "Web Mining Applications and Techniques", Idea Group Publishing,2005.

WIRELESS SENSOR NETWORKS		
Course Code: 20SCN253	**No. of Credits: 3=3: 0 : 0 (L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 Hours	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 52**

Course Objectives:

1. Architect sensor networks for various application setups
2. Explore the design space and conduct trade-off analysis between performance and resources.
3. Devise appropriate data dissemination protocols and model links cost.
4. Determine suitable medium access protocols and radio hardware.
5. Prototype sensor networks using commercial components.
6. Provision quality of service, fault-tolerance, security and other dependability requirements while coping with resource constraints.

UNIT No	Syllabus Content	No of Hours
1	**Introduction, Overview and Applications of Wireless Sensor Networks** Introduction, Basic overview of the Technology, **Applications of Wireless Sensor Networks**: Introduction, Background, Range of Applications, Examples of Category 2 WSN Applications, Examples of Category 1 WSN Applications, Another Taxonomy of WSN Technology (Chapter 1: 1.1, 1.2, Chapter2: 2.1-2.6)	**10**
2	**Basic Wireless Sensor Technology and Systems**: Introduction, Sensor Node Technology, Sensor Taxonomy, WN Operating Environment, WN Trends, **Wireless Transmission Technology and Systems**: Introduction, Radio Technology Primer, Available Wireless Technologies (Chapter3: 3.1-3.5, Chapter 4: 4.1-4.3)	**10**
3	**MAC and Routing Protocols for Wireless Sensor Networks**: Introduction, Background, Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC case Study, IEEE 802.15.4 LR-WPANs Standard Case Study. **Routing Protocols for Wireless Sensor Networks**: Introduction, Background, Data Dissemination and Gathering, Routing Challenges and Design Issues in WSNs, Routing Strategies in WSNs. (Chapter 5: 5.1-5.6, Chapter 6: 6.1-6.5)	**10**
4	**Transport Control and Middleware for Wireless Sensor Networks** Traditional Transport Control Protocols, Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, Performance of Transport Control Protocols. **Middleware for Wireless Sensor Networks**: Introduction, WSN Middleware Principles, Middleware Architecture, Existing Middleware. (Chapter 7: 7.1-7.4, Chapter 8: 8.1-8.4)	**10**
5	**Network Management and Operating System for Wireless Sensor Networks**	**12**

	Introduction, Network Management Requirements, Traditional Network Management Models, Network Management Design Issues. **Operating Systems for Wireless Sensor Networks**: Introduction, Operating System Design Issues, Examples of Operating Systems. (Chapter 9: 9.1-9.5, Chapter 10: 10.1-10.3)	

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar & group activity is evaluated for 10 marks

Course Outcomes:
After the completion of the above course students will be able to:
CO1: Develop applications of wireless sensor actuator networks
CO2: Implement the elements of distributed computing and network protocol.
CO3: Explore various hardware, software platforms that exist for sensor networks

TEXT BOOKS:
1. KAZEM SOHRABY, DANIEL MINOLI, TAIEB ZNATI, "Wireless Sensor Networks: Technology, Protocols and Applications:,
2. WILEY , Second Edition (Indian) , 2014

REFERENCE BOOKS:
1 .Ian F. Akyildiz, Mehmet Can Vuran "Wireless Sensor Networks", Wiley 2010
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

Course Title : MOBILE APPLICATION DEVELOPMENT		
Course Code:20SCN254	**No. of Credits: 3 =3:0:0(L-T-P-S)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50+50=100**	**Total No. of Contact Hours : 52**

Course objectives:

1. To study the System Architecture and identify the system requirements for mobile applications.
2. To gain the knowledge on utilizing different resources.
3. To learn the basics of user interface widgets for creating applications.
4. To be familiarize accessing databases in Android applications.
5. To publish the Android applications

Unit No.	Syllabus	No. of Hours
1	**Fundamentals of Android Development:** Introduction to Android: Understanding the Android Software Stack, Installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text View Control, Using the Android Emulator, The Android Debug Bridge (ADB),Launching Android Applications on a Handset, **Basic Widgets:** Understanding the Role of Android Application Components, Understanding the Utility of Android API, Overview of the Android Project Files, Understanding Activities, Role of the Android Manifest File, Creating the User Interface, Commonly Used Layouts and Controls, Event Handling, Displaying Messages Through Toast, Creating and Starting an Activity, Using the EditText Control, Choosing Options with CheckBox, Choosing Mutually Exclusive Items Using RadioButtons. **Text Book:** Chapter-1,2	**10**
2	**Building Blocks for Android Application Design:** Laying out Controls in Containers, Introduction to Layouts, Linear Layout, Relative Layout, Absolute Layout, Using Image View, Frame Layout, Table Layout, Grid Layout, Adapting to Screen, Orientation. **Utilizing Resources and Media :** Resources , Using Drawable, Resources, Switching States with Toggle Buttons ,Creating an Image Switcher Application, Scrolling Through Scroll View , Playing Audio, Playing Video, Displaying Progress with Progress Bar, Using Assets. **Text Book:** Chapter-3,4	**10**

3	**Using Selection Widgets and Debugging:** Using ListView, Using the Spinner Control, Using the GridView Control, Creating an Image Gallery Using the View Pager Control, Using the Debugging Tool: Dalvik Debug Monitor Service (DDMS) ,Debugging Applications, Using the Debug Perspective. **Displaying and Fetching Information Using Dialogs & Fragments:** What are Dialogs? Selecting the Date and Time in One Application, Fragments, Creating Fragments with Java Code, Creating Special Fragments **Text Book:** Chapter-5 and 6	**10**
4	**Building Menus and Storing Data:** Creating Interactive Menus and ActionBars: Menus and Their Types: Creating Menus Through XML, Creating Menus Through Coding, Applying a Context Menu to a ListView, Using the ActionBar, Replacing a Menu with the ActionBar, Creating a Tabbed ActionBar, Creating a Drop-Down List ActionBar, **Using Databases**:Using the SQLiteOpenHelper Class, Accessing Databases with the ADB, Creating a Data Entry Form. **Implementing Drawing and Animation**, Drawing on the Screen, Animations, Applying Interpolators. **Text Book:** Chapter-7,8 and 9	**10**
5	**Creating and Using Content Providers:** What Is a Content Provider, Understanding the Android Content URI, Using Content Providers, Creating a Custom Content Provider. **Creating and Consuming Services**, Moving Tasks to Background Threads, Accessing Data from the Internet, Creating a Service, Creating a Bound Service, Setting Up Alarms, Using Sensors. **Publishing Android Applications**: Setting Versioning Information of an Application, Generating a Certificate, Digitally Signing the Android Applications, and Generating the APK, Distributing Applications with Google Play. **Text Book:** Chapter-12,13 and 14	**12**

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar is evaluated for 10 marks

Course Outcomes:

At the end of the course, the students will be able to:
CO1: To install & configure the software's to develop android applications
CO2: To analyze the challenges in mobile application design and development of UI.
CO3: To design & develop mobile applications for complex problems.
CO4: Implement the design using Android Developer Tools.
CO5: To develop mobile applications and register on store.

COs	Mapping with PO's
CO1	PO1, PO2, PO4, PO5
CO2	PO1, PO2,PO3,PO4,PO5,PO6
CO3	PO2, PO4, PO9, PO10
CO4	PO5, PO7, PO8, PO11, PO12
CO5	PO4, PO7, PO11, PO12

Text Books:

1. B.M.Hirwani- Android programming unleased, SAMS, Pearson publications-2016.

Reference Books:

1. Shane Conder, Lauren Darcey: Android Wireless Application Development, Pearson education, 2010.

Detailed Scheme

ACADEMIC YEAR 2019-2020

Dr. Ambedkar Institute of Technology
Bangalore

III-IV (2018-2020 BATCH)

M.Tech in Computer Network Engineering

Department Of Information Science and Engineering

Dr. Ambedkar Institute of Technology
SCHEME OF TEACHING AND EXAMINATION III SEMESTER (Autonomous) 2019-20
M. Tech in Computer Network Engineering
Batch:2018-2020

III Semester

Sl. No.	Sub Code	Subject Title	Teaching Department	Teaching hours per week			Maximum Marks allotted			Examination Credits
				Lecture	Tutorial/ Seminar/ Assignment	Practical / Field Work	CIE	SEE	Total	
1.	18SCxN31	Client Server Programming	ISE	4	-		50	50	100	**4**
2.	18SCN32X	Professional Elective 3	ISE	4	-	-	50	50	100	**3**
3.	18SCN33X	Professional Elective 4	ISE	4	-	-	50	50	100	**3**
4	18SCNI34	Internship					50	50	100	**8**
5	18SCNS35	Technical Seminar					50		50	**2**
6.	18SCNP36	Project phase - I	ISE	-	-	-	50	-	50	**2**
Total							**300**	**200**	**500**	**22**

Professional Elective 3			Professional Elective 4		
Sl .No	Name of the Subject	Subject Code	Sl .No	Name of the Subject	Subject Code
1	Service Oriented Architecture	18SCN321	1	Business Intelligence and its Applications	18SCN331
2	Web Mining	18SCN322	2	Social Network Analysis	18SCN332
3	Cybercrime and Digital Forensic	18SCN323	3	Distributed Computing	18SCN333
4	Machine learning	18SCN324	4	Protocol Engineering	18SCN334

Note:

1. **Technical Seminar:** CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide, if any, and a senior faculty of the department. Participation in the seminar by all postgraduate students of the same and other semesters of the programme shall be mandatory. The CIE marks awarded for Technical Seminar, shall be based on the evaluation of Seminar Report, Presentation skill and Question and Answer session
2. **Project Phase-1:** Students in consultation with the guide/co-guide if any, shall pursue literature survey and complete the preliminary requirements of selected Project work. Each student shall prepare relevant introductory project document, and present a seminar. CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide if any, and a senior faculty of the department. The CIE marks awarded for project work phase -1, shall be based on the evaluation of Project Report, Project Presentation skill and Question and Answer session
3. SEE as per the norms
4. **2. Internship:** Those, who have not pursued /completed the internship shall be declared as failed and have to complete during subsequent SEE examinations after satisfying the internship requirements. Internship SEE shall be as per the norms.

Dr. Ambedkar Institute of Technology
SCHEME OF TEACHING AND EXAMINATION (Autonomous) 2018-19
M. Tech in Computer Network Engineering
Batch:2018-2020

IV semester

Sl. No.	Sub Code	Subject Title	Teaching Department	Teaching hours per week			Maximum Marks allotted			Examination Credits
				Lecture	Tutorial/ Seminar/ Assignment	Practical / Field Work	CIE	SEE	Total	
1	18SCNP41	Project Work Phase II – Midterm Internal Evaluation	**ISE**	-	-	-	50		50	**2**
2	18SCNP42	Project work evaluation and viva voce	**ISE**				100	100	200	**22**
Total							**150**	**100**	**250**	**24**
Grand Total (I to IV Semester) : 88 Credits										

1. Project Phase-2:
CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide, if any, and a Senior faculty of the department. The CIE marks awarded for project work phase -2, shall be based on the evaluation of Project Report subjected to plagiarism check, Project Presentation skill and Question and Answer session in the ratio 50:25:25.
SEE shall be at the end of IV semester. Project work evaluation and Viva-Voce examination (SEE), after satisfying the plagiarism check, shall be as per the norms.

III SEMESTER

Course Title : CLIENT-SERVER PROGRAMMING		
Course Code:18SCN31	**No. of Credits: 4 =4:0:0:0(L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50+50=100**	**Total No. of Contact Hours : 52**

Course objectives:

- To familiarize Context Switching and Protocol Software, I/O.
- To learn System Calls, I/O Functions available in UNIX.
- To identify with the Socket interface, TCP, UDP protocols.
- To recognize various Client Softwares.
- To distinguish the various algorithms issue related to server software design.

Unit No.	Syllabus	No. of Hours
1	**The Client Server Model and Software Design:** Introduction, Motivation, Terminology and Concepts. (Chapter 2: 2.1-2.4) **Concurrent Processing in Client-Server software:**Introduction, Concurrency in Networks, Concurrency in Servers, Terminology and Concepts, An example of Concurrent Process Creation, Executing New Code, ContextSwitching and Protocol Software Design, Concurrency and Asynchronous I/O. (Chapter 3: 3.1-3.9) **Program Interface to Protocols:** Introduction, Loosely Specified Protocol Software Interface, Interface Functionality, Conceptual Interface Specification, System Calls,Two Basic Approaches to Network Communication, The Basic I/O Functions available in UNIX, Using UNIX I/O with TCP/IP. (Chapter 4: 4.1-4.9)	**10**
2	**The Socket Interface:** Introduction, Berkley Sockets, Specifying a Protocol Interface,The Socket Abstraction, Specifying an End Point Address, A Generic Address Structure, Major System Calls used with Sockets, Utility Routines for Integer Conversion, Using Socket Calls in a Program, Symbolic Constants for Socket Call Parameters. (Chapter 5:5.1-5.11) **Algorithms and Issues in Client Software Design:** Introduction,Learning Algorithms instead of Details, Client Architecture, Identifying the Location of a Server, Parsing an Address Argument, Looking up a Domain Name, Looking up a well-known Port by Name, Port Numbers and Network Byte Order, Looking up a Protocol by Name, The TCP Client Algorithm, Allocating a Socket, Choosing a Local Protocol Port Number, A fundamental Problem in choosing a Local IP Address,Connecting a TCP Socket to a Server, Communicating with the Server using TCP,Reading a response from a TCP Connection, Closing a TCP Connection,Programming a UDP Client, Connected and Unconnected UDP Socket, Using Connect with UDP, Communicating with a Server using UDP, Closing a Socket that uses UDP, Partial Close for UDP, A Warning about UDP	**10**

	Unreliability. (Chapter 6: 6.1-6.25)	
3	**Example Client Software:** Introduction, The Importance of Small Examples, HidingDetails, An Example Procedure Library for Client Programs, Implementation ofConnect TCP, Implementation of Connect UDP, A Procedure that Forms Connections,Using the Example Library, The DAYTIME Service, Implementation of a TCP Clientfor DAYTIME, Reading from a TCP Connection, The Time Service, Accessing theTIME Service, Accurate Times and Network Delays, A UDP Client for the TIMEService, The ECHO Service, A TCP Client for the ECHO Service, A UDP Client forthe ECHO Service. (Chapter 7: 7.1-7.19)	**10**
4	**Algorithms and Issues in Server Software Design:** Introduction, The ConceptualServer Algorithm, Concurrent Vs Iterative Servers, Connection-Oriented Vs Connectionless Access, Connection-Oriented Servers, Connectionless Servers, Failure,Reliability and Statelessness, Optimizing Stateless Servers, Four Basic Types of Servers, Request Processing Time, Iterative Server Algorithms, An Iterative Connection-Oriented Server Algorithm, Binding to a Well Known Address usingINADDR_ANY, Placing the Socket in Passive Mode, Accepting Connections andusing them. An Iterative Connectionless Server Algorithm, Forming a Reply Addressin a Connectionless Server, Concurrent Server Algorithms, Master and Slave Processes, A Concurrent Connectionless Server Algorithm, A concurrent Connection-Oriented Server Algorithm, Using separate Programs as Slaves, Apparent Concurrencyusing a Single Process, When to use each Server Types, The Important Problem ofServer Deadlock, Alternative Implementations. (Chapter 8: 8.1-8.28)	**12**
5	**Iterative, Connectionless Servers (UDP):** Introduction, Creating a Passive Socket,Process Structure, An example TIME Server. (Chapter 9: 9.1-9.5) **Iterative, Connection-Oriented Servers(TCP):** Introduction, Allocating a Passive TCP Socket, A Server for the DAYTIMEService, Process Structure, An Example DAYTIME Server, Closing Connections,Connection Termination and Server Vulnerability. (Chapter 10: 10.1-10.8) **Concurrent, Connection-OrientedServers (TCP):** Introduction, Concurrent ECHO, Iterative Vs ConcurrentImplementations, Process Structure, An example Concurrent ECHO Server, Cleaningup Errant Processes. (Chapter 11-11.1-11.7)	**10**

Note 1: All units will have internal choice

Note 2: Three Assignments are evaluated for 10 marks:

Assignment – I from Units 1 and 2.

Assignment – II from Units 3 and 4

Assignment -III from Unit 5

Note 3:Subject Seminar is evaluated for 10 marks

Course Outcomes:

At the end of the course, the students will be able to:
CO1: Develop applications using the Client-Server software, Context Switching and Protocol Software, I/O.
CO2: Analyze the Programming System Calls &I/O Functions.
CO3: Design & Develop the Socket interface using TCP &UDP protocols.

COs	Mapping with PO's
CO1	PO1,PO2,PO3,PO4
CO2	PO1,PO2,PO3,PO4
CO3	PO1,PO2,PO3,PO10,PO11
CO4	PO1,PO2,PO4,PO9,PO11

Text Books:

1. Douglas E.Comer, David L. Stevens: Internetworking with TCP/IP – Vol. 3, Client-Server Programming and Applications, BSD Socket Version with ANSI C, 2nd Edition,Pearson, 2001.

PROFESSIONAL ELECTIVE -3

SERVICE ORIENTED ARCHITECTURE		
Course Code:18SCN321	**No. of Credits: 3 =4:0:0:0(L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50+50=100**	**Total No. of Contact Hours : 52**

Course objectives:

1. Learn web service and SOA related tools and governance.
2. Compare various architecture for application development.
3. Illustrate the importance of SOA in Application Integration.
4. Learn web services standards and technologies.
5. Learn service oriented analysis and design for developing SOA based applications.

Unit No.	Syllabus	No. of Hours
1	**SOA BASICS: Software Architecture;** Need for Software Architecture, Objectives of Software Architecture, Types of IT Architecture, Architecture Patterns and Styles, **Service oriented Architecture;** Service Orientation in Daily Life, Evolution of SOA, Drives for SOA, Dimension of SOA, Key components, perspective of SOA, **Enterprise-wide SOA;** Considerations for Enterprise -Wide SOA, Strawman Architecture For Enterprise-Wide-SOA-Enterprise, SOA- Layers, Application Development Process, SOA Methodology For Enterprise **Text 1: Ch2: 2.1 – 2.4; Ch3:3.1-3.7; Ch4: 4.1 – 4.5**	**10**
2	**Enterprise Applications;** Architecture Considerations, Solution Architecture for enterprise application, **Software platforms for enterprise Applications;** Package Application Platforms, Enterprise Application Platforms, **Service- oriented-Enterprise Applications;** Considerations for Service-Oriented Enterprise Applications, Patterns for SOA, Pattern-Based Architecture for Service-Oriented Enterprise Application(java reference model only). Composite Applications, SOA programming models. **Text 1: Ch5:5.1, 5.2, 6.1, 6.2** (PageNo 74-81)**, 7.1 – 7.5**	**12**
3	**SOA ANALYSIS AND DESIGN;** Need For Models, Principles of Service Design, Design of Activity Services, Design of Data sevices, Design of Client services and Design of business process services, **Technologies of SOA;**Technologies For Service Enablement, Technologies For Service Integration,Technologies for Service orchestration. **Text 1: Ch 8: 8.1 – 8.6, 9.1 – 9.3**	**10**
4	**Business case for SOA;** Stakeholder OBJECTIVES, Benefits of SOA, Cost Savings, Return on Investment, SOA Governance, **Security and implementation;** SOA Governance, SOA Security, approach for enterprise wide SOA implementation, **Trends in SOA;** Technologies in Relation to SOA,	**10**

	Advances in SOA. **Text 1: Ch 10: 10.1 -10.4, Ch 11: 11.1 to 11.3, Ch12:12.2, 12.3**	
5	**SOA Technologies-PoC;** Loan Management System(LMS), PoC-Requirements Architectures of LMS **SOA based integration;** integrating existing application, **SOA best practices,** Basic SOA using REST. Role of WSDL,SOAP and JAVA/XML Mapping in SOA. **Text 1:Page No 245-248; ReferenceBook:Chapter3; Text 1:Page No 307-310 Text 2: Ch 3, Ch4**	**12**

Note 1: All units will have internal choice

Note 2: Three Assignments are evaluated for 10 marks:

Assignment – I from Units 1 and 2.

Assignment – II from Units 3 and 4

Assignment -III from Unit 5

Note 3:Subject Seminar is evaluated for 10 marks

Course Outcomes:

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

CO1: Explain the basic Principles of SOA and apply these concepts to the simple applications.

CO2: Design the entities involved to develop architecture of web services.

CO3: Implement SOA using current technologies in particular to web services.

CO4: Evaluate emerging and proposed standards required to use SOA concepts in building applications.

CO5: Implementation of RESTful services.

COs	Mapping with PO's
CO1	PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO9,PO11
CO2	PO1,PO2,PO3,PO4,PO5,PO9,PO10,PO11
CO3	PO1,PO2,PO3,PO4,PO5,PO7,PO9,PO11
CO4	PO1,PO2,PO3,PO4,PO5
CO5	PO1,PO2,PO3,PO4,PO6

Text Books:

1. Shankar Kambhampaly, "Service–Oriented Architecture for Enterprise Applications",Wiley Second Edition, 2014.
2. Mark D. Hansen, "SOA using Java Web Services", Practice Hall, 2007.**Reference Books:**

Reference Books:

1. Waseem Roshen, "SOA-Based Enterprise Integration", Tata McGraw-HILL, 2009.

WEB MINING		
Course Code:18SCN322	**No. of Credits: 3 =4:0:0:0(L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50+50=100**	**Total No. of Contact Hours : 52**

Course objectives:

1. Compare and contrast different knowledge discovery issues in Web mining.
2. Analyze the different algorithms commonly used by Web application.
3. Apply the role played by Web mining in Information retrieval and extraction.
4. Demonstrate the documents structures and grouping,
5. Use the probabilistic model for web mining.

Unit No.	Syllabus	No. of Hours
1	**INTRODUCTION:** Crawling and Indexing, Topic Directories, Clustering and Classification, Hyperlink Analysis, Resource Discovery and Vertical Portals, Structured vs.Unstructured Data Mining .**INFRASTRUCTURE and WEB SEARCH** -- Crawling the web – HTML and HTTP Basics – Crawling Basics – Engineering Large Scale Crawlers- Putting together a Crawler- Boolean Queries and the Inverted Index – Relevance Ranking – Similarity Search. **Text 1: Ch1;Ch2,Ch3**	**10**
2	**INFORMATION RETRIEVAL:** Information Retrieval and Text Mining - Keyword Search Nearest-Neighbor Methods -Measuring Similarity - Web-Based Document Search -Document–Matching - Inverted Lists -Evaluation of Performance - Structure in a Document Collection - Clustering Documents by Similarity- Evaluation of Performance - Information Extraction - Patterns and Entities from Text- Co reference and Relationship Extraction - Template Filling and Database Construction. **Text 2: Ch4;Ch5**	**12**
3	**LEARNING I:** Similarity and Clustering – Formulations and approaches- Bottom up and Top down Partitioning Paradigms – Clustering and Visualization via Embedding's – Probabilistic Approaches to clustering – Collaborative Filtering .**SUPERVISED LEARNING**: The Supervised Learning Scenario, Overview of Classification Strategies, Evaluating Text Classifiers, Nearest Neighbor Learners, Feature Selection. **Text 1:Ch4,Ch5.1-5.5**	**10**
4	**LEARNING II : SUPERVISED LEARNING** – Bayesian Learners, Exploiting Hierarchy among Topics, Maximum Entropy Learners, Discriminative Classification, Hypertext Classification, **SEMI SUPERVISED LEARNING**-- Expectation Maximization, Labeling Hypertext Graphs and Co- training. **Text 1:Ch5.6-5.10,Ch6**	**10**
5	**APPLICATIONS:** Social Network Analysis- Social Sciences and Bibliometry – Page Rank and HITS – Shortcomings of coarse Grained Graph model- Enhanced Models and Techniques- Evaluation of Topic Distillation- Measuring and Modeling the Web –	**12**

	Resource Discovery – Collecting Important Pages Preferentially – Similarity Search Using Link Topology – Topical Locality and Focused Crawling – Discovering Communities- The Future of Web Mining. **Text 1:Ch7,Ch8,Ch9**	

Note 1: All units will have internal choice

Note 2: Three Assignments are evaluated for 10 marks:

Assignment – I from Units 1 and 2.

Assignment – II from Units 3 and 4

Assignment -III from Unit 5

Note 3:Subject Seminar is evaluated for 10 marks

Course Outcomes:

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

CO1:Identify the application areas for web content mining, web structure mining and web usage mining.

CO2:Develop schemes to crawl the web data, organize and index

CO3:Cluster the documents for fast access

CO4:Develop algorithms used by web mining applications.

Select between different approaches and techniques of web mining

COs	Mapping with PO's
CO1	PO1,PO2,PO3
CO2	PO1,PO2,PO3
CO3	PO1,PO2,PO3
CO4	PO2,PO3,PO4
CO5	PO2,PO3,PO4

Text Books:

1. Soumen Chakrabarti, "Mining the Web: Discovery Knowledge from Hypertext Data," Elsevier Science 2003

2. Sholom Weiss, "Text Mining: Predictive Methods for Analyzing Unstructured Information", Springer, 2005

Reference Books:

1. Min Song, Yi-fang Brrok Wu, "Handbook of Research on Text and Web Mining Technologies", Vol I & II, Information Science Reference (IGI), 2009

2.K.P.Soman, ShyamDiwakar, V.Ajay, "Insight into Data Mining Theory and Practice ," Prentice Hall of India Private Ltd 2006

3.Anthony Scime, "Web Mining Applications and Techniques", Idea Group Publishing,2005

4.Margret H.Dunham "DATA MINING - Introductory and Advanced Concepts", PearsonEducation,2003.

Course Title :	CYBERCRIME AND DIGITAL FORENSICS	
Course Code:18SCN323	**No. of Credits: 3 =4:0:0:0(L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50+50=100**	**Total No. of Contact Hours : 52**

Course objectives:

1. Introduce students to the area of cybercrime and Forensics.
2. To understand the motive and causes for cybercrime, detection and handling.
3. To know the areas affected by cybercrime and investigation tools used in cyber forensic.
4. To get knowledge of report writing and forensic ethics

Unit No.	Syllabus	No. of Hours
1	Introduction to Cybercrime: Cybercrime Definition and Origins of the word. Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes. Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective. Cybercrime and the Indian ITA 2000. A Global Perspective on Cybercrimes. Cybercrime Era: Survival Mantra for the Netizens. Cyberoffenses: How Criminals Plan Them: How Criminals Plan the Attacks. Social Engineering, Cyberstalking, Cybercafe and Cybercrimes. Botnets: The Fuel for Cybercrime. Attack Vector. Cloud Computing.	**10**
2	Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era. Security Challenges Posed by Mobile Devices. Registry Settings for Mobile Devices, Authentication Service Security. Attacks on Mobile/Cell phones. Mobile Devices: Security Implications for Organizations. Organizational Measures for Handling Mobile Organizational Security Policies and Measures in Mobile Computing Era, Laptops.	**10**
3	Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms. Trojan Horses and Backdoors. Steganography. DOS and DDoS Attacks. SQL Injection. Buffer Overflow. Attacks on Wireless Networks Phishing and Indentity Theft: Introduction. Phishing. Identity Theft (ID Theft)	**10**
4	Understanding Computer Forensic: Introduction. Historical Background of Cyberforensics. Digital Forensics Science. The Need for Computer Forensics. Cyberforensics and Digital Evidence. Forensics Analysis of E-Mail. Digital Forensics Life Cycle. Chain of Custody Concept. Network Forensics. Approaching a Computer Forensics Investigation. Setting up a Computer Forensics Laboratory: Understanding the Requirements. Computer Forensics and Steganography. Relevance of the OSI 7 Layer Model to Computer Forensics. Forensics and Social Networking Sites. The Security/Privacy Threats Computer Forensics from Compliance Perspective. Challenges in computer Forensics. Special Tools and Techniques Forensics Auditing, Antiforensics.	**10**
5	Forensics Ethics: Report Writing for High-Tech investigations:	**12**

	Importance of reports. Guidelines writing reports. Reports findings and Forensic software Tool; Expert testimony in High-Tech Investigations: Preparing for Testimony, Testifying in court, Preparing for hearing, preparing evidences: Ethics for the Expert Witness: Applying Ethics and code, organizations with Codes of Ethics, Ethical difficulties, An ethics Exercise.	

Note 1: All units will have internal choice

Note 2: Three Assignments are evaluated for 10 marks:

Assignment – I from Units 1 and 2.

Assignment – II from Units 3 and 4

Assignment -III from Unit 5

Note 3:Subject Seminar is evaluated for 10 marks

Course Outcomes:

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

CO1.AcquireKnowledge on the cyber security, cybercrime and forensics.

CO2: Examine a tools and methods used in cybercrime and know about the tools and techniques for the forensics.

CO3: Ability to follow strict policies and procedures with meticulous record keeping.

CO4: Describe the fundamentals of digital forensics

CO5: Ability to write reports on technical issues in a non-technical manner.

COs	Mapping with PO's
CO1	PO2,PO6
CO2	PO5,PO6
CO3	PO5
CO4	PO6
CO5	PO8,PO10,PO11

Text Books:

1. SunitBelapure and Nina Godbole, " Cyber Security: Understandign Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN:978-81-265-2179-1. Publish Date 2013.
2. Bill Nelson, Amelia Philips and Christopher Steuart, " Guide to Computer Fores=nsics and Investigations", 4th Edition. Cengage Learning. 2015.

Reference Books:

1. Thomas J. Mowbray, " Cybersecurity: Managing Systems, Conducting Testing, and Investigating Instrusions", Copyright@2014 by John Wiley & Sons, Inc. ISBN:978-1-118-84965-1.2014.

James Graham. Ryan Olson. Rick Howard. "Cyber Security Essentials", CRC Press. 15-Dec-2010.

Course Title : MACHINE LEARNING		
Course Code: 18SCN324	**No. of Credits: 3 =4:0:0:0(L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 30+70=100**	**Total No. of Contact Hours : 52**

Course objectives:

1. To understand the basic concepts of machine learning along with decision trees.
2. To understand the neural networks and genetic algorithms
3. To understand the Bayesian techniques
4. To understand the instant based learning
5. To understand the analytical learning and reinforced learning

Unit No.	Syllabus	No. of Hours
1	**INTRODUCTION and DECISION TREES**: **Machine learning basics:** What is machine learning? Key terminology , Key tasks of machine learning,How to choose the right algorithm, Steps in developing a machine learning application , Why Python. **Classifying with k-Nearest Neighbors** Classifying with distance measurements, Prepare: importing data with Python , Putting the kNN classification, algorithm into action, How to test a classifier, Example: improving matches with kNN, Prepare: parsing data from a text file, Analyze: creating scatter plots with Matplotli, Prepare: normalizing numeric values, Test: testing the classifier as a whole program, Use: putting together a useful system, Example: a handwriting recognition system, Prepare: converting images	**11**
2	**NEURAL NETWORKS and GENETIC ALGORITHMS:** Biological Multilayer Networks and Back Propagation Algorithms, Genetic Algorithms, Neural Network Representation, Problems, Perceptrons,	**10**
3	**BAYESIAN AND COMPUTATIONAL LEARNING** Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probably Learning – Sample Complexity for Finite and Infinite Hypothesis Spaces – Mistake Bound Model.	**10**
4	**K- Nearest Neighbor Learning –** Locally Weighted Regression – Radial Basis Functions – Case-Based Reasoning – Sequential Covering Algorithms – Learning Rule Sets – Learning First Order Rules – Learning Sets of First Order Rules – Induction as Inverted Deduction – Inverting Resolution	**10**
5	**MODULE V ANALYTICAL LEARNING AND REINFORCED LEARNING** Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning	**11**

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar is evaluated for 10 marks

Course Outcomes:

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

CO1: Choose the learning techniques with this basic knowledge. Also, obtain knowledge on decision tree learning.
CO2: Apply andcomprehend neural network and genetic algorithms techniques.
CO3: Obtain knowledge about supervised and semi-supervised learning.
CO4: Differentiate between reinforcement and analytical learning techniques.
CO5: Differentiate different machine learning applications.

COs	Mapping with PO's
CO1	PO1,PO4
CO2	PO2,PO3,PO4
CO3	PO3,PO4
CO4	PO3,PO4,PO5,PO6
CO5	PO4,PO8,PO9,PO11

Text Books:

1. Peter Harrington , "Machine Learning in Action", MANNING Shelter Island Publication, ISBN 9781617290183, 2012. Unit1: Chapter 1-2.4 (page no 1 to 36)

2. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education, 2013.
Unit2, Unit3, Unit4 and Unit5: Chapter 4 to chapter 8 (Page no: 81 to 247)

Reference Books:

1. Ethem Alpaydin, "Introduction to Machine Learning", 2nd Ed., PHI Learning Pvt. Ltd., 2013.
2. T. Hastie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer; 1st edition, 2001.

PROFESSIONAL ELECTIVE-4

BUSINESS INTELLIGENCE AND ITS APPLICATIONS		
Course Code:18SCN331	**No. of Credits: 3 =4:0:0:0(L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50+50=100**	**Total No. of Contact Hours : 52**

Course objectives:

- Evaluate the key elements of a successful business intelligence (BI) program
- Apply a BI meta model that turns outcomes into actions
- Extract and transform data from an operational data to a data business data
- Evaluate business analytics and performance measurement tools

Unit No.	Syllabus	No. of Hours
1	Development Steps, BI Definitions, BI Decision Support Initiatives, Development Approaches, Parallel Development Tracks, BI Project Team Structure, Business Justification, Business Divers, Business Analysis Issues, Cost – Benefit Analysis, Risk Assessment, Business Case Assessment Activities, Roles Involved In These Activities, Risks Of Not Performing Step, Hardware, Middleware, DBMS Platform, Non Technical Infrastructure Evaluation Text1:Ch1,Ch2	**10**
2	Managing The BI Project, Defining And Planning The BI Project, Project Planning Activities, Roles And Risks Involved In These Activities, General Business Requirement, Project Specific Requirements, Interviewing Process Text1:Ch3,Ch4	**12**
3	Differences in Database Design Philosophies, Logical Database Design, Physical Database Design, Activities, Roles And Risks Involved In These Activities, Incremental Rollout, Security Management, Database Backup And Recovery Text1:Ch8,Ch15	**10**
4	Evaluation Activities, The Information Asset and Data Valuation, Actionable Knowledge – ROI, BI Applications, The Intelligence Dashboard Text2:Ch3,Ch4	**10**
5	Business View of Information technology Applications: Business Enterprise excellence, Key purpose of using IT, Type of digital data, basics f enterprise reporting, BI road ahead. Text2:Ch7,Ch9	**10**

Note 1: All units will have internal choice

Note 2: Three Assignments are evaluated for 10 marks:

Assignment – I from Units 1 and 2.

Assignment – II from Units 3 and 4

Assignment -III from Unit 5

Note 3:Subject Seminar is evaluated for 10 marks

Course Outcomes:

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

CO1:Explain the complete life cycle of BI/Analytical development
CO2:llustrate technology and processes associated with Business Intelligence framework
CO3:Demonstrate a business scenario, identify the metrics, indicators
CO4:Make recommendations to achieve the business goal.

COs	Mapping with PO's
CO1	PO1,PO4
CO2	PO2,PO3,PO4
CO3	PO3,PO4
CO4	PO3,PO4,PO5,PO6
CO5	PO4,PO8,PO9,PO11

Text Books:

1. Larissa T Moss and ShakuAtre – Business Intelligence Roadmap : The Complete Project Lifecycle for Decision Support Applications, Addison Wesley Information Technology Series, 2003.
2. R N Prasad, Seema Acharya – Fundamentals of Business Analytics , Wiley India, 2011.

Reference Books:

1. David Loshin -Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann, ISBN 1-55860-196-4.
2. Brian Larson - Delivering Business Intelligence with Microsoft SQL Server 2005, McGraw Hill,2006.
3. Lynn Langit - Foundations of SQL Server 2008 Business Intelligence –Apress,ISBN13: 978-1-4302-3324-4, 2

SOCIAL NETWORK ANALYSIS		
Course Code:18SCN332	**No. of Credits: 3 =4:0:0:0(L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50+50=100**	**Total No. of Contact Hours : 52**

Course objectives:

- List basic principles behind network analysis algorithms.
- Acquire essential knowledge of network analysis.
- Apply real world data with examples from today's most popular social networks.
- Plan and execute network analytical computations

Unit No.	Syllabus	No. of Hours
1	**Introduction to social network analysis and Descriptive network analysis:** Introduction to new science of networks. Networks examples. Graph theory basics. Statistical network properties. Degree distribution, clustering coefficient. Frequent patterns. Network motifs. Cliques and k-cores. Text1:Ch1,Ch2	**10**
2	**Network structure, Node centralities and ranking on network:** Nodes and edges, network diameter and average path length. Node centrality metrics: degree, closeness and betweenness centrality. Eigenvector centrality and PageRank. Algorithm HITS. Text1:Ch3,Ch4	**12**
3	**Network communities and Affiliation networks:** Networks communities. Graph partitioning and cut metrics. Edge betweenness. Modularity clustering. Affiliation network and bipartite graphs. 1-mode projections. Recommendation systems. Text1:Ch5,Ch6	**10**
4	**Information and influence propagation on networks and Network visualization:** Social Diffusion. Basic cascade model. Influence maximization. Most influential nodes in network. Network visualization and graph layouts. Graph sampling. Low -dimensional projections. Text1:Ch7,Ch8	**10**
5	**Social media mining and SNA in real world: FB/VK and Twitter analysis:** Natural language processing and sentiment mining. Properties of large social networks: friends, connections, likes, re-tweets. Text1:Ch9,Ch10	**10**

Note 1: All units will have internal choice

Note 2: Three Assignments are evaluated for 10 marks:

Assignment – I from Units 1 and 2.

Assignment – II from Units 3 and 4

Assignment -III from Unit 5

Note 3:Subject Seminar is evaluated for 10 marks

Course Outcomes:

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

CO1:Define notation and terminology used in network science.

CO2:Demonstrate, summarize and compare networks.

CO3:Explain basic principles behind network analysis algorithms.

CO4:Analyzing real world network

.

COs	Mapping with PO's
CO1	PO1,PO4
CO2	PO2,PO3,PO4
CO3	PO3,PO4
CO4	PO3,PO4,PO5,PO6
CO5	PO4,PO8,PO9,PO11

Text Books:

1. David Easley and John Kleinberg. "Networks, Crowds, and Markets: Reasoning About a Highly Connected World." Cambridge University Press 2010

Reference Books:

1. Stanley Wasserman and Katherine Faust. "Social Network Analysis. Methods and Applications." Cambridge University Press, 1994.
2. Eric Kolaczyk, Gabor Csardi. "Statistical Analysis of Network Data with R (Use R!)". Springer,2014.

Course Title: DISTRIBUTED COMPUTING		
Course code: 18SCN333	**No. of Credits:3=4 : 0 : 0 (L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 hours	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours :52**

Course Objectives

- To learn Concepts of Distributed system Management.
- To acquire knowledge on File Sharing, DFS Implementation, Replication in Distributed File System
- To understand the concepts of Cryptanalysis, Secure channels, Access control
- Overview of security concepts in distributed computing.

UNIT No	Syllabus Content	No of Hours
1	Distributed System management: Introduction, Resource management, Task Assignment Approach, Load Balancing Approach, Load-Sharing Approach, Process management in a Distributed Environment, Process Migration, Threads, Fault Tolerance. TEXT1 Chapter 7	**10**
2	Distributed Shared Memory :Introduction, Basic Concepts of DSM, Hardware DSM, Design Issue in DSM Systems, Issue in Implementing DSM Systems, Heterogeneous and Other DSM Systems, Case Studies TEXT 1 Chapter 8	**10**
3	Distributed File System: Introduction to DFS, File Models, Distributed File System Design, Semantics of File Sharing, DFS Implementation, File Caching in DFS, Replication in DFS, Case studies. Naming: Introduction, Desirable features of a good naming system, Basic concepts, System-oriented names, Object-locating mechanisms, Issues in designing human-oriented names, Name caches, Naming and security, Case study: Domain name service. TEXT 1 Chapter 9,10	**10**
4	Security in distributed systems: Introduction, Cryptography, Secure channels, Access control, Security Management, Case studies. TEXT 1 Chapter 11	**8**
5	Real-Time Distributed operating Systems: Introduction, Design issues in real-time distributed systems, Real-time communication, Real-time scheduling, Emerging Trends in distributed Computing: Introduction to emerging trends, Grid Computing, SOA, Cloud computing, the future of emerging Trends. TEXT 1 Chapter 12 14	**12**

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar is evaluated for 10 marks

Course Outcomes:
After completing the course the students are able to:.
CO1: Identify the components of Distributed System management
CO2: Realize shared memory concept
CO3 : Apply the concepts of Distributed File System
CO4: Analyze the naming system
CO5: Incorporate the security features in Distributing System Management

Cos	Mapping with PO's
CO1	PO2,PO3
CO2	PO2,PO3
CO3	PO2,PO3,PO5
CO4	PO4
CO5	PO2,PO3

TEXT BOOK:

1. Sunitha Mahajan, Seema Shah: Distributing Computing, Published by Oxford University press 2010.

REFERENCE BOOKS/WEBLINKS:

1. Tanenbaum S. Maarten V.S.: Distributed Systems Principles and Paradigms, (Pearson Education)

PROTOCOL ENGINEERING		
Course Code: 18SCN334	**No. of Credits: 3=4: 0 : 0 (L-T-P)**	**No. of lecture hours/week : 4**
Exam Duration : 3 Hours	**CIE + SEE = 50 + 50 =100**	**Total No. of Contact Hours : 52**

Course Objectives:

1. Introduce concepts about communication protocols.
2. To understand about protocol specification.
3. To introduce students to the concepts of SDL along with testing concepts.

Unit No	Syllabus Content	No of Hours
1	Introduction: Communication model, Communication Software, Communication Subsystems, Communication Protocol Definition/Representation, Formal and Informal Protocol Development Methods, Protocol Engineering Phases. **Textbook1 : Chapter1**- 1.1, 1.2, 1.3, 1.4, 1.5, 1.6	**08**
2	Network Reference Model: Layered Architecture, Network Services and Interfaces, Protocol Functions: Encapsulation, Segmentation, Reassembly, Multiplexing, Addressing, OSI Model Layer Functions, TCP/IP Protocol Suite, Application Protocols. **Textbook1:Chapter2** – 2.1, 2.2, 2.3, 2.4, 2.5, 2.7	**8**
3	Protocol Specification: Components of specification, Service specification, Communication Service Specification Protocol entity specification: Sender, Receiver and Channel specification, Interface specifications, Interactions, Multimedia specifications, Alternating Bit Protocol Specification, RSVP specification. **Textbook1: Chapter3** – 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7(3.7.1, 3.7.3)	**12**
4	Protocol Specification Language (SDL): Salient Features. Communication System Description using SDL, Structure of SDL. Data types and communication paths, Examples of SDL based Protocol Specifications: Question and answer protocol, X-on-X-off protocol, Alternating bit protocol, Sliding window protocol specification, TCP protocol specification, SDL based platform for network, OSPF, BGP Multi Protocol Label Switching SDL components. **Textbook1: Chapter4 –** 4.1(4.1.1, 4.1.2, 4.1.3)	**12**
5	Protocol Verification / Validation: Protocol Verification using FSM, ABP Verification, Protocol Design Errors, Deadlocks, Unspecified Reception, Non-executable Interactions, State Ambiguities, Protocol Validation	**12**

	Approaches: Perturbation Technique, Reachability Analysis, Fair Reachability Graphs, Process Algebra based Validation, SDL Based Protocol Verification: ABP Verification, Liveness Properties, SDL Based Protocol Validation: ABP Validation. **Textbook1: Chapter 5** – 5.1, 5.2 (5.2.1), 5.4 (5.4.1, 5.4.2, 5.4.3, 5.4.4), 5.5 (5.5.2, 5.5.3, 5.5.4), 5.6 (5.6.1), 5.7 (5.7.1) Protocol Conformance and Performance Testing: Conformance Testing Methodology and Framework, Local and Distributed Conformance Test Architectures, Test Sequence Generation Methods: T, U, D and W methods. **Textbook1: Chapter 6** – 6.3, 6.4 (6.4.1, 6.4.2, 6.4.3), 6.5 (6.5.1, 6.5.2, 6.5.3, 6.5.4)	

Note 1: All units will have internal choice
Note 2: Three Assignments are evaluated for 10 marks:
Assignment – I from Units 1 and 2.
Assignment – II from Units 3 and 4
Assignment -III from Unit 5
Note 3:Subject Seminar is evaluated for 10 marks

Course Outcomes:
After completing the course the students are able to:

CO1: Analyze the theoretical aspects of communication protocols.
CO2: Apply ideas and techniques discussed to various protocol designs.
CO3: Recognize the different protocol specification and understand about SDL.
CO4: Analyze various testing methodologies.

Cos	Mapping with Pos
CO1	PO1,PO3,PO6,PO7,PO12
CO2	PO3,PO5,PO7
CO3	PO1,PO4,PO5,PO7
CO4	PO1,PO9,PO10,PO12

TEXT BOOK:
Pallapa Venkataram and Sunilkumar S. Manvi: Communication Protocol Engineering, PHI, 2004.

REFERENCE BOOKS/WEB LINKS:
Mohammed G. Gouda: Elements of Protocol Design, Wiley Student Edition, 2004.

Course Title : INTERNSHIP		
Course Code: 18SCNI34	No. of Credits: 8	No. of lecture hours/week :
Exam Duration : 3 hours	CIE + SEE = 50+50=100	Total No. of Contact Hours :

Course Title : TECHNICAL SEMINAR		
Course Code: 18SCNS35	No. of Credits: 2	No. of lecture hours/week :
Exam Duration : 3 hours	CIE = 50	Total No. of Contact Hours :

Course Title : PROJECT PHASE-1		
Course Code: 18SCNP36	No. of Credits: 2	No. of lecture hours/week :
Exam Duration : 3 hours	CIE =50	Total No. of Contact Hours :

IV SEMESTER

Course Title : PROJECT WORK PHASE II – MIDTERM INTERNAL EVALUATION		
Course Code: 18SCNP41	**No. of Credits: 2**	**No. of lecture hours/week :**
Exam Duration : 3 hours	**CIE =50**	**Total No. of Contact Hours :**

Course Title : PROJECT WORK EVALUATION AND VIVA VOCE		
Course Code: 18SCNP42	**No. of Credits: 22**	**No. of lecture hours/week :**
Exam Duration : 3 hours	**CIE + SEE=100+100=200**	**Total No. of Contact Hours :**