

**VISVESVARAYA TECHNOLOGICAL UNIVERSITY
BELAGAVI**

**Scheme of Teaching and Examinations and Syllabus
M.Tech Computer Network Engineering (SCN)
(Effective from Academic year 2020 - 21)**

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examinations – 2020 - 21
M.Tech Computer Network Engineering (SCN)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)

I SEMESTER

| Sl. No | Course | Course Code | Course Title | Teaching Hours /Week | | Examination | | | | Credits |
|--------------|--------|-------------|---|----------------------|---|----------------------|------------|------------|-------------|-----------|
| | | | | Theory | Practical/ Field work/ Assignment | Duration in hours | CIE Marks | SEE Marks | Total Marks | |
| 1 | PCC | 20SCN11 | Title Of The Course (Mathematics course) | 04 | -- | 03 | 40 | 60 | 100 | 4 |
| 2 | PCC | 20SCN12 | Advances in Computer Networks | 04 | -- | 03 | 40 | 60 | 100 | 4 |
| 3 | PCC | 20SCN13 | Information and Network Security | 04 | -- | 03 | 40 | 60 | 100 | 4 |
| 4 | PCC | 20SCN14 | Internet of Things | 04 | -- | 03 | 40 | 60 | 100 | 4 |
| 5 | PCC | 20SCN15 | Blockchain Technology | 04 | -- | 03 | 40 | 60 | 100 | 4 |
| 6 | PCC | 20SCNL16 | Computer Networks and IoT Laboratory | - | 04 | 03 | 40 | 60 | 100 | 2 |
| 7 | PCC | 20RMI17 | Research Methodology and IPR | 02 | -- | 03 | 40 | 60 | 100 | 2 |
| TOTAL | | | | 22 | 04 | 21 | 280 | 420 | 700 | 24 |

Note: PCC: Professional core.

Internship: All the students have to undergo mandatory internship of 6 weeks during the vacation of I and II semesters and /or II and III semesters. A University examination shall be conducted during III semester and the prescribed credit shall be counted for the same semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared as fail in internship course and have to complete the same during the subsequent University examination after satisfying the internship requirements.

Note: (i) Four credit courses are designed for 50 hours Teaching – Learning process.
(ii) Three credit courses are designed for 40 hours Teaching – Learning process.

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Scheme of Teaching and Examinations – 2020 - 21
M.Tech Computer Network Engineering (SCN)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)

II SEMESTER

| Sl. No | Course | Course Code | Course Title | Teaching Hours /Week | | Examination | | | Credits | |
|--------------|--------|-------------|-----------------------------------|----------------------|---|----------------------|------------|------------|------------|-------------|
| | | | | Theory | Practical/ Field work/ Assignment/ Project | Duration in hours | CIE Marks | SEE Marks | | Total Marks |
| 1 | PCC | 20SCN21 | Multimedia Communications | 04 | -- | 03 | 40 | 60 | 100 | 4 |
| 2 | PCC | 20SCN22 | Network Programming | 04 | -- | 03 | 40 | 60 | 100 | 4 |
| 3 | PCC | 20SCN23 | Wireless Ad hoc Networks | 04 | -- | 03 | 40 | 60 | 100 | 4 |
| 4 | PEC | 20SCN24X | Professional elective 1 | 04 | -- | 03 | 40 | 60 | 100 | 4 |
| 5 | PEC | 20SCN25X | Professional elective 2 | 04 | -- | 03 | 40 | 60 | 100 | 4 |
| 6 | PCC | 20SCNL26 | Network Programming Laboratory | -- | 04 | 03 | 40 | 60 | 100 | 2 |
| 7 | PCC | 20SCN27 | Technical Seminar | -- | 02 | -- | 100 | -- | 100 | 2 |
| TOTAL | | | | 20 | 06 | 20 | 340 | 360 | 700 | 24 |

Note: PCC: Professional core, PEC: Professional Elective.

Professional Elective 1

Professional Elective 2

| Course Code under 20SCN24X | Course title | Course Code under 20SCN25X | Course title |
|-------------------------------|--|-------------------------------|--------------------------|
| 20SCN241 | Advances in Storage Area Network | 20SCN251 | Wireless Sensor Networks |
| 20SCN242 | Switching & Statistical Multiplexing In Telecommunications | 20SCN252 | Social Network Analysis |
| 20SCN243 | Software Defined Networks | 20SCN253 | Network Management |
| 20SCN244 | Mobile Application Development | 20SCN254 | Object Oriented Design |

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 in the ratio 50:25:25.

2. Internship: All the students shall have to undergo mandatory internship of 6 weeks during the vacation of I and II semesters and /or II and III semesters. A University examination shall be conducted during III semester and the prescribed credit shall be counted in the same semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared as fail in internship course and have to complete the same during the subsequent University examination after satisfying the internship requirements.

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III SEMESTER

| Sl. No | Course | Course Code | Course Title | Teaching Hours /Week | | Examination | | | Credits | |
|--------------|------------|-------------|-------------------------------------|---|---|----------------------|------------|------------|------------|-------------|
| | | | | Theory | Practical/ Field work/ Assignment | Duration in hours | CIE Marks | SEE Marks | | Total Marks |
| 1 | PCC | 20SCN31 | Cloud Computing and its application | 04 | -- | 03 | 40 | 60 | 100 | 4 |
| 2 | PEC | 20SCN32X | Professional elective 3 | 04 | -- | 03 | 40 | 60 | 100 | 3 |
| 3 | PEC | 20SCN33X | Professional elective 4 | 04 | -- | 03 | 40 | 60 | 100 | 3 |
| 4 | Project | 20SCN34 | Project Work phase -1 | -- | 02 | -- | 100 | -- | 100 | 2 |
| 5 | PCC | 20SCN35 | Mini-Project | -- | 02 | -- | 100 | -- | 100 | 2 |
| 6 | Internship | 20SCNI36 | Internship | (Completed during the intervening vacation of I and II semesters and /or II and III semesters.) | | 03 | 40 | 60 | 100 | 6 |
| TOTAL | | | | 12 | 02 | 12 | 260 | 240 | 500 | 20 |

Note: PCC: Professional core, PEC: Professional Elective.

| Professional elective 3 | | Professional elective 4 | |
|----------------------------|---|----------------------------|-------------------------------|
| Course Code under 20SCN32X | Course title | Course Code under 20SCN33X | Course title |
| 20SCN321 | Computer Systems Performance Analysis | 20SCN331 | Analysis of Computer Networks |
| 20SCN322 | Network Routing Algorithm | 20SCN332 | Protocol Engineering |
| 20SCN323 | Information Security Policies in Industry | 20SCN333 | Web Engineering |
| 20SCN324 | Machine Learning Techniques | 20SCN334 | Web Mining |

Note:

1. 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 in the ratio 50:25:25.

SEE (University examination) shall be as per the University norms.

2. Internship: Those, who have not pursued /completed the internship shall be declared as fail in internship course and have to complete the same during subsequent University examinations after satisfying the internship requirements. Internship SEE (University examination) shall be as per the University norms.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
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IV SEMESTER

| Sl. No | Course | Course Code | Course Title | Teaching Hours /Week | | Examination | | | Credits | |
|--------------|---------|-------------|-----------------------|----------------------|---|----------------------|-----------|------------------------|------------|-------------|
| | | | | Theory | Practical/ Field work/ Assignment | Duration in hours | CIE Marks | SEE Marks Viva voce | | Total Marks |
| 1 | Project | 20SCN41 | Project work phase -2 | -- | 04 | 03 | 40 | 60 | 100 | 20 |
| TOTAL | | | | -- | 04 | 03 | 40 | 60 | 100 | 20 |

Note:

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 University norms.



| M.TECH COMPUTER NETWORK ENGINEERING (SCN) Choice Based Credit System (CBCS) and Outcome Based Education(OBE) SEMESTER – I | | | |
|--|-------------------|------------|----|
| ADVANCES IN COMPUTER NETWORKS | | | |
| Course Code | 20SCN12, 20LNI321 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |
| Module-1 | | | |
| Foundation: 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. | | | |
| Module-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), Host Configuration (DHCP), Error Reporting (ICMP), Virtual Networks and Tunnels. | | | |
| Module-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 | | | |
| Module-4 | | | |
| End-to-End 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 Extensions, Queuing Disciplines, FIFO, Fair Queuing, TCP Congestion Control, Additive Increase/ Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery | | | |
| Module-5 | | | |
| Congestion Control and Resource Allocation Congestion-Avoidance Mechanisms, DEC bit, Random Early Detection (RED), Source-Based Congestion Avoidance. The Domain Name System (DNS), Electronic Mail (SMTP,POP,IMAP,MIME), World Wide Web (HTTP), Network Management (SNMP) | | | |
| Course outcomes: | | | |
| At the end of the course the student will be able to: | | | |
| <ul style="list-style-type: none"> • List and classify network services, protocols and architectures, explain why they are layered. • Choose key Internet applications and their protocols, and apply to develop their own applications (e.g. Client Server applications, Web Services) using the sockets API. • Explain develop effective communication mechanisms using techniques like connection establishment, queuing theory, recovery Etc. • Explain various congestion control techniques. | | | |
| Question paper pattern: | | | |
| The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. | | | |

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

| Sl No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
|-------|---|----------------------------------|----------------|------------------------------|
| 1 | Computer Networks :A System Approach | Larry Peterson and Bruce S Davis | Elsevier | 5 th Edition 2014 |
| 2 | Internetworking with TCP/IP, Principles, Protocols and Architecture | Douglas E Comer | PHI | 6th Edition 2014 |

Reference Books

| | | | | |
|---|---|--------------------|------------------|--------------|
| 1 | Computer Networks, Protocols , Standards and Interfaces | Uyless Black | PHI | 2 nd Edition |
| 2 | TCP /IP Protocol Suite | Behrouz A Forouzan | Tata McGraw-Hill | 4 th Edition |

**M.TECH COMPUTER NETWORK ENGINEERING (SCN)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - I**

INFORMATION AND NETWORK SECURITY

| | | | |
|----------------------------|-------------------------|------------|----|
| Course Code | 20SCN13, 20LNI13 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |

Module-1

Classical Encryption Techniques Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Mono-alphabetic Cipher, Playfair Cipher, Hill Cipher, Poly alphabetic Cipher, One Time Pad. **Block Ciphers and the data encryption standard:** Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, 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

Module 2

Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. Public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. **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 Z_p , elliptic curves over $GF(2^m)$, Elliptic curve cryptography, Analog of Diffie-hellman key exchange, Elliptic curve encryption/ decryption, security of Elliptic curve cryptography, Pseudorandom number generation based on an asymmetric cipher, PRNG based on RSA.

Module 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, public key infrastructure. **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, Remote user Authentication using Asymmetric encryption, Mutual Authentication, one way Authentication, federated identity management, identity management, identity federation, personal identity verification.

Module 4

Wireless network security: Wireless security, Wireless network threats, Wireless network measures, mobile device security, security threats, mobile device security strategy, IEEE 802.11 Wireless LAN overview, the Wi-Fi alliance, IEEE 802 protocol architecture. Security, IEEE 802.11i services, IEEE 802.11i phases of operation, discovery phase, Authentication phase, key management phase, protected data transfer phase, the IEEE 802.11i pseudorandom function. **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, and Padding. **HTTPS** Connection Initiation, Connection Closure. **Secure Shell(SSH)** Transport Layer Protocol, User Authentication Protocol, Connection Protocol

Module 5

Electronic Mail Security: Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate processing, enhanced security services, Domain keys identified mail, internet mail architecture, E-Mail threats, DKIM strategy, DKIM functional flow. **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, cryptographic suits.

Course outcomes:

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

- Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
- Identify the security issues in the network and resolve it.
- Evaluate security mechanisms using rigorous approaches, including theoretical.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.

- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

| Sl No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
|-------|-----------------------------------|----------------------|----------------|-------------------------|
| 1 | Cryptography and Network Security | William Stallings | Pearson | 6 th edition |

Reference Books

| | | | | |
|---|---------------------------------------|---------------|-----|-----------------|
| 1 | Cryptography and Information Security | V K Pachghare | PHI | 2 nd |
|---|---------------------------------------|---------------|-----|-----------------|

**M.TECH COMPUTER NETWORK ENGINEERING (SCN)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - I**

INTERNET OF THINGS

| | | | |
|----------------------------|---|------------|----|
| Course Code | 20SCN14, 20SCS15, 20LNI22, 20SCE23 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |

Module-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, Over-The-Air-Passive Surveillance/Ring of Steel, Control Application Examples, Myriad Other Applications.

Module -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 Low power WPAN, Zigbee IP(ZIP), IPSO

Module – 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 Compression Schemes, Quality of Service in IPv6, Migration Strategies to IPv6.

Module-4

Case Studies illustrating IoT Design-Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.

Module-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 Case Study.

Course outcomes:

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

- Develop schemes for the applications of IOT in real time scenarios
- Manage the Internet resources
- Model the Internet of things to business
- Understand the practical knowledge through different case studies

Understand data sets received through IoT devices and tools used for analysis

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

| SI No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
|-------|---|--------------------------------|--------------------|------------------|
| 1 | Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications | Daniel Minoli | Wiley | 2013 |
| 2 | Internet of Things: A Hands on Approach | Arshdeep Bahga, Vijay Madiseti | Universities Press | 2015 |

Reference Books

| | | | | |
|---|------------------------------|---|----------|---------------------|
| 1 | The Internet of Things | Michael Miller | Pearson | 2015 First Edition |
| 2 | Designing Connected Products | Claire Rowland, Elizabeth Goodman et.al | O'Reilly | First Edition, 2015 |

**M.TECH COMPUTER NETWORK ENGINEERING (SCN)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - I**

BLOCKCHAIN TECHNOLOGY

| | | | |
|----------------------------|------------------|------------|----|
| Course Code | 20SCN15, 20SCS13 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |

Module-1

Introduction: Basic Cryptographic primitives used in Blockchain – Secure, Collision-resistant hash functions, digital signature, public key cryptosystems, zero-knowledge proof systems. Need for Distributed Record Keeping, Modelling faults and adversaries, Byzantine Generals problem, Consensus algorithms and their scalability problems, Why Nakamoto Came up with Blockchain based cryptocurrency?

Module-2

Technologies Borrowed in Blockchain – hash pointers, Consensus, Byzantine Models of fault

| | | | | |
|---|---|--|--|-------------------------|
| tolerance, digital cash etc.Bitcoin blockchain - Wallet - Blocks - Merkle Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin. Bitcoin, the challenges, and solutions | | | | |
| Module-3 | | | | |
| Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS).Bitcoin scripting language and their use | | | | |
| Module-4 | | | | |
| Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - The Turing Completeness of Smart Contract Languages and verification challenges, Using smart contracts to enforce legal contracts, comparing Bitcoin scripting vs. Ethereum Smart Contracts. Some attacks on smart contracts | | | | |
| Module-5 | | | | |
| Hyperledger fabric, the plug and play platform and mechanisms in permissioned blockchain.Beyond Cryptocurrency – applications of blockchain in cyber security, integrity of information, E-Governance and other contract enforcement mechanisms. Limitations of blockchain as a technology, and myths vs. reality of blockchain technology | | | | |
| Course outcomes: | | | | |
| At the end of the course the student will be able to: | | | | |
| <ul style="list-style-type: none"> • Define and Explain the fundamentals of Blockchain • Illustrate the technologies of blockchain • Describe the models of blockchain • Analyze and demonstrate the Ethereum • Analyze and demonstrate Hyperledger fabric | | | | |
| Question paper pattern: | | | | |
| The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. | | | | |
| <ul style="list-style-type: none"> • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. | | | | |
| Textbook/ Textbooks | | | | |
| Sl No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
| 1 | Blockchain Technology: Cryptocurrency and Applications | S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan | Oxford University Press | 2019 |
| 2 | Bitcoin and cryptocurrency technologies: a comprehensive introduction | Arvind Narayanan et. Al. | Princeton University Press | 2016 |
| Reference Books | | | | |
| 1 | Research perspectives and challenges for Bitcoin and cryptocurrency | Joseph Boneau et al, SoK | IEEE Symposium on security and Privacy | 2015 |
| 2 | The bitcoin backbone protocol - analysis and applications | J.A.Garay et al, | EUROCRYPT LNCS VOI 9057, (| 2015 |

| | | | | |
|---|---|---------------|--|------|
| | | | VOLII), pp 281-310 | |
| 3 | Analysis of Blockchain protocol in Asynchronous networks | R.Pass et al | EUROCRYPT | 2017 |
| 4 | Fruitchain, a fair blockchain | R.Pass et al | , PODC | 2017 |
| 5 | Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming' | Josh Thompson | Create Space Independent Publishing Platform | 2017 |

| | | | |
|---|-------------------|------------|----|
| M.TECH COMPUTER NETWORK ENGINEERING (SCN) | | | |
| Choice Based Credit System (CBCS) and Outcome Based Education(OBE) | | | |
| SEMESTER - II | | | |
| MULTIMEDIA COMMUNICATIONS | | | |
| Course Code | 20SCN21, 20SCE322 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |
| Module-1 | | | |
| Introduction, multimedia information representation, multimedia networks, multimedia applications, Application and networking terminology, network QoS and application QoS, Digitization principles,. Text, images, audio and video. | | | |
| Module 2 | | | |
| Text and image compression,, compression principles, text compression- Runlength, Huffman, LZW, Document Image compression using T2 and T3 coding, image compression- GIF, TIFF and JPEG | | | |
| Module 3 | | | |
| Audio and video compression, audio compression – principles, DPCM, ADPCM, Adaptive and Linear predictive coding, Code-Excited LPC, Perceptual coding, MPEG and Dolby coders video compression, video compression principles. | | | |
| Module 4 | | | |
| Video compression standards: H.261, H.263, MPEG, MPEG 1, MPEG 2, MPEG-4 and Reversible VLCs, MPEG 7 standardization process of multimedia content description, MPEG 21 multimedia framework. | | | |
| Module 5 | | | |
| Notion of synchronization, presentation requirements, reference model for synchronization, Introduction to SMIL, Multimedia operating systems, Resource management, process management techniques. | | | |
| Course outcomes: | | | |
| At the end of the course the student will be able to: | | | |
| <ul style="list-style-type: none"> • Deploy the right multimedia communication models. • Apply QoS to multimedia network applications with efficient routing techniques. • Solve the security threats in the multimedia networks. • Develop the real-time multimedia network applications | | | |
| Question paper pattern: | | | |
| The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to | | | |

60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

| Sl No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
|-------|--|---------------------------------|-------------------|------------------|
| 1 | Multimedia Communications | Fred Halsall | Pearson education | 2001 |
| 2 | Multimedia: Computing, Communications and Applications | Raif Steinmetz, Klara Nahrstedt | Pearson education | 2002 |

Reference Books

| | | | | |
|---|----------------------------------|---|-------------------|-------|
| 1 | Multimedia Communication Systems | K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic | Pearson education | 2004 |
| 2 | John Billamil, Louis Molina | Multimedia : An Introduction | PHI | 2002. |

**M.TECH COMPUTER NETWORK ENGINEERING (SCN)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - II**

NETWORK PROGRAMMING

| | | | |
|----------------------------|-------------------------|------------|----|
| Course Code | 20SCN22, 20LNI14 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |

Module-1

Introduction to network application, client/server communication, OSI Model, BSD Networking history, Test Networks and Hosts, Unix Standards, 64-bit architectures, Transport Layer: TCP, UDP and SCTP.

Module 2

Sockets Introduction – socket address structures, value-result arguments, byte ordering and manipulation functions, address conversion functions, Elementary TCP Sockets – socket, connect, bind, listen, accept , fork and concurrent server design, getsockname and getpeername functions and TCP Client/Server Example- client/server programming through TCP sockets, Normal startup, termination, POSIX signal handling, Signal handling in server, Crashing, rebooting of server host, shutdown

Module 3

I/O Multiplexing and Socket Options, Elementary SCTP Sockets- Interface Models, sctp_xx functions, shutdown function, Notifications, SCTP Client/Server Examples – One-to-Many, Head-of-Line Blocking, Controlling number of streams and Termination, IPv4 and IPv6 Interoperability–different interoperability scenarios.

Module 4

Daemon Processes, syslogd, daemonizing functions and the inetd super server, Advanced I/O functions- readv, writev, sendmsg and recvmsg, Ancillary data, Advanced polling, Unix domain protocols- socket address structure, functions and communication scenarios, Nonblocking I/O – connect and accept examples.

| Module 5 | | | | |
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| ioctl operations- socket, file, interface configuration information, ARP cache and routing table operations, Routing sockets- data link socket address structure, reading and writing, sysctl operations, interface name and index functions, Key Management functions – reading, writing, SADB, SA, Dynamically Maintaining SA's, Out-of-Band data, Threads- basic thread functions, TCP echo server using threads, Mutexes and Conditional variables. | | | | |
| Course outcomes: | | | | |
| At the end of the course the student will be able to: | | | | |
| <ul style="list-style-type: none"> • Develop applications that communicate with each other using TCP and SCTP. • Identify the IPv4 and IPv6 compatibility. • Evaluate socket programming APIs. | | | | |
| Question paper pattern: | | | | |
| The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. | | | | |
| <ul style="list-style-type: none"> • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. | | | | |
| Textbook/ Textbooks | | | | |
| SI No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
| 1 | UNIX Network Programming | W. Richard Stevens, Bill Fenner, Andrew M. Rudoff | Pearson | Volume 1, Third Edition, 2004 |
| Reference Books | | | | |
| 1 | Network Programming in C | Barry Nance | PHI | 2002 |
| 2 | Windows Socket Network Programming | Bob Quinn, Dave Shute | Pearson | 2003. |
| 3 | UNIX Network Programming | Richard Stevens | | ,Second Edition. |

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| M.TECH COMPUTER NETWORK ENGINEERING (SCN) | | | |
| Choice Based Credit System (CBCS) and Outcome Based Education(OBE) | | | |
| SEMESTER - II | | | |
| WIRELESS AD HOC NETWORKS | | | |
| Course Code | 20SCN23, 20LNI241 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |
| Module-1 | | | |
| Ad-hoc Wireless Networks Introduction, Issues in Ad-hoc Wireless Networks, Ad-hoc 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. | | | |

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| Module -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. | | | | |
| Module – 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. | | | | |
| Module-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; Other Transport Layer Protocols for Ad-hoc Networks; Security in Ad-hoc Wireless Networks, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management and Secure Touting Ad-hoc Wireless Networks. | | | | |
| Module-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, Network 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. | | | | |
| Course outcomes: | | | | |
| At the end of the course the student will be able to: | | | | |
| <ul style="list-style-type: none"> • Design their own wireless network • Evaluate the existing network and improve its quality of service • Choose appropriate protocol for various applications • Examine security measures present at different level • Analyze energy consumption and management | | | | |
| Question paper pattern: | | | | |
| The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. | | | | |
| <ul style="list-style-type: none"> • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. | | | | |
| Textbook/ Textbooks | | | | |
| Sl No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
| 1 | Ad-hoc Wireless Networks | C. Siva Ram Murthy & B. S. Manoj | Pearson Education | 2 nd Edition, 2011 |
| Reference Books | | | | |
| 1 | Ad-hoc Wireless Networks, | Ozan K. Tonguz and | John Wiley | 2007 |

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|---|---|--|--------------------------------|------|
| | | Gianguigi Ferrari | | |
| 2 | Ad-hoc Wireless Networking | Xiuzhen Cheng, Xiao Hung, Ding- Zhu Du | Kluwer Academic Publishers, | 2004 |
| 3 | Ad-hoc Mobile Wireless Networks- Protocols and Systems | C.K. Toh | Pearson Education | 2002 |

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| M.TECH COMPUTER NETWORK ENGINEERING (SCN) | | | |
| Choice Based Credit System (CBCS) and Outcome Based Education(OBE) | | | |
| SEMESTER - II | | | |
| ADVANCES IN STORAGE AREA NETWORK | | | |
| Course Code | 20SCN241, 20LNI243, 20SCE323, 20SIT253 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |
| Module-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. | | | |
| Module 2 | | | |
| I/O Techniques: The Physical I/O path from the CPU to the Storage System; SCSI; Fibre 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. | | | |
| Module 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. | | | |
| Module 4 | | | |
| SAN Architecture and Hardware devices: Overview, Creating a Network for storage; SAN Hardware devices; The fibre channel switch; Host Bus Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective. Software Components of SAN: The switch's Operating system; Device Drivers; Supporting the switch's components; Configuration options for SANs. | | | |
| Module 5 | | | |
| Management of Storage Network: System Management, Requirement of management System, Support by Management System, Management Interface, Standardized Mechanisms, Property Mechanisms, In-band Management, Use of SNMP, CIM and WBEM, Storage Management Initiative Specification (SMI-S), CMIP and DMI, Optional Aspects of the Management of Storage Networks, Summary | | | |
| Course outcomes: | | | |

| At the end of the course the student will be able to: | | | | |
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| The students should be able to: | | | | |
| <ul style="list-style-type: none"> Identify the need for performance evaluation and the metrics used for it Apply the techniques used for data maintenance. Realize strong virtualization concepts Develop techniques for evaluating policies for LUN masking, file systems | | | | |
| Question paper pattern: | | | | |
| The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. | | | | |
| <ul style="list-style-type: none"> The question paper will have ten full questions carrying equal marks. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub questions) from each module. Each full question will have sub question covering all the topics under a module. The students will have to answer five full questions, selecting one full question from each module. | | | | |
| Textbook/ Textbooks | | | | |
| Sl No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
| 1 | Storage Networks Explained | Ulf Troppens, Rainer Erkens and Wolfgang Muller | Wiley India | 2013 |
| Reference Books | | | | |
| 1 | Storage Networks The Complete Reference | Robert Spalding | Tata McGraw-Hill | 2011 |
| 2 | Storage Networking Fundamentals – An Introduction to Storage Devices, Subsystems, Applications, Management, and File Systems | Marc Farley | Cisco Press, | 2005 |
| 3 | Storage Area Network Essentials A Complete Guide to understanding and Implementing SANs | Richard Barker and Paul Massiglia | Wiley India, | 2006 |

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| M.TECH COMPUTER NETWORK ENGINEERING (SCN) | | | |
| Choice Based Credit System (CBCS) and Outcome Based Education(OBE) | | | |
| SEMESTER - II | | | |
| SWITCHING & STATISTICAL MULTIPLEXING IN TELECOMMUNICATIONS | | | |
| Course Code | 20SCN242 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |
| Module-1 | | | |
| Introduction: Evolution of Telecommunication, Simple Telephone Communication, Basics of a Switching System, Manual Switching System, Major Telecommunication Networks. Why Digital: Advantages of Digital Voice Networks, Digital Signal Processing, Disadvantages of Digital Voice Networks | | | |
| Module -2 | | | |
| Switching: Crossbar Switching, Principles of Common Control, Touch Tone Dial Telephone, Principles of Crossbar Switching, Crossbar Switch Configurations, Crosspoint Technology, | | | |

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| Crossbar Exchange Organization | | | | |
| Module – 3 | | | | |
| Electronic Space Division Switching: Stored Program Control, Centralized SPC, Distributed SPC, Software Architecture, Application Software, Enhanced Services, Two-stage, Three-stage and n-stage Networks. Digital Transmission and Multiplexing: Sampling, Quantization and Binary Coding, Quantization Noise, Companding, Differential Coding, Vocoders, Pulse Transmission, Line Coding, Time Division Multiplexing | | | | |
| Module-4 | | | | |
| Time Division Switching: Basic Division Space and Time Switching, Time Multiplexed Space and Time Switching, Combination Switching, Three-stage and n-stage Combination Switching | | | | |
| Module-5 | | | | |
| Traffic Engineering: Network Traffic Load and Parameters, Grade of Service and Blocking Probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking Models and Loss Estimates, Delay Systems | | | | |
| Course outcomes: | | | | |
| At the end of the course the student will be able to: | | | | |
| <ul style="list-style-type: none"> • Explain basics of telecommunications and digital form • Elaborate switching and multiplexing, telecommunication. • Illustrate transmission control in telecommunication • Design and develop switching, multiplexing and traffic control. | | | | |
| Question paper pattern: | | | | |
| The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. | | | | |
| <ul style="list-style-type: none"> • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. | | | | |
| Textbook/ Textbooks | | | | |
| Sl No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
| 1 | Telecommunication Switching Systems and Networks | Thiagarajan Viswanathan | PHI | 1992 |
| 2 | Digital Telephony | John.C.Bellamy | John Wiley and Sons Inc. | 3rd Edition, 2002 |
| Reference Books | | | | |
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| M.TECH COMPUTER NETWORK ENGINEERING (SCN) | | | | |
|---|---------------------------------------|--|----------------|------------------|
| Choice Based Credit System (CBCS) and Outcome Based Education(OBE) | | | | |
| SEMESTER - II | | | | |
| SOFTWARE DEFINED NETWORKS | | | | |
| Course Code | 20SCN243, 20LNI31, 20SCE333, 20SCS253 | | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | | SEE Marks | 60 |
| Credits | 04 | | Exam Hours | 03 |
| Module-1 | | | | |
| Introduction, Centralized and Distributed Control and Data Planes, OpenFlow | | | | |
| Module-2 | | | | |
| SDN Controllers, Network Programmability, | | | | |
| Module-3 | | | | |
| Data Center Concepts and Constructs, Network Function Virtualization | | | | |
| Module-4 | | | | |
| Network Topology and Topological Information Abstraction, Building an SDN Framework | | | | |
| Module-5 | | | | |
| Use Cases for Bandwidth Scheduling, Manipulation, and Calendaring, Use Cases for Input Traffic Monitoring, Classification, and Triggered Actions | | | | |
| Course outcomes: | | | | |
| At the end of the course the student will be able to: | | | | |
| <ul style="list-style-type: none"> • Explain the fundamentals of SDN and make use of open flow tool • Illustrate the concepts of controllers and network programmability • Explain data center and NFV • Build an SDN framework • Report use case | | | | |
| Question paper pattern: | | | | |
| The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. | | | | |
| <ul style="list-style-type: none"> • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. | | | | |
| Textbook/ Textbooks | | | | |
| SI No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
| 1 | SDN: Software Defined Networks | Ken Gray, Thomas D. Nadeau | O'Reilly | 2013 |
| Reference Books | | | | |
| 2 | Software Defined Networks | Paul Goransson Black Timothy Culver | Elsevier | 2nd Edition 2016 |

**M.TECH COMPUTER NETWORK ENGINEERING (SCN)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - II**

MOBILE APPLICATION DEVELOPMENT

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|-------------------------------|--|------------|----|
| Course Code | 20SCN244, 20LNI323, 20SFC332, 20SIT241 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |

Module-1

Introduction to mobile communication and computing: Introduction to mobile computing, Novel applications, limitations and GSM architecture, Mobile services, System architecture, Radio interface, protocols, Handover and security. Smart phone operating systems and smart phones applications.

Module -2

Fundamentals of Android Development: Introduction to Android., The Android 4.1 Jelly Bean SDK, 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.

Module – 3

The Intent of Android Development, Four kinds of Android Components: Activity, Service, Broadcast Receiver and Content Provider. Building Blocks for Android Application Design, Laying Out Controls in Containers. Graphics and Animation: Drawing graphics in Android, Creating Animation with Android’s Graphics API.

Module-4

Creating the Activity, Working with views: Exploring common views, using a list view, creating custom views, understanding layout. Using Selection Widgets and Debugging Displaying and Fetching Information Using Dialogs and Fragments. Multimedia: Playing Audio, Playing Video and Capturing Media. Advanced Android Programming: Internet, Entertainment, and Services.

Module-5

Displaying web pages and maps, communicating with SMS and emails. Creating and using content providers: Creating and consuming services, publishing android applications

Course outcomes:

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

- Describe the requirements for mobile applications
- Explain the challenges in mobile application design and development
- Develop design for mobile applications for specific requirements
- Implement the design using Android SDK
- Implement the design using Objective C and iOS
- Deploy mobile applications in Android and iPone marketplace for distribution

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.

| <ul style="list-style-type: none"> • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. | | | | |
|--|--|--|----------------------|--------------------|
| Textbook/ Textbooks | | | | |
| SI No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
| 1 | Mobile Computing: (technologies and Applications | N. N. Jani | S chand | |
| 2 | Android programming | B.M.Hirwani | Pearson publications | 2013 |
| 3 | Android in Action | W. Frank Ableson, Robi Sen and C. E. Ortiz | DreamTech Publisher | Third Edition-2012 |
| Reference Books | | | | |
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| M.TECH COMPUTER NETWORK ENGINEERING (SCN) Choice Based Credit System (CBCS) and Outcome Based Education(OBE) SEMESTER - II | | | |
| WIRELESS SENSOR NETWORKS | | | |
| Course Code | 20SCN251, 20SCS334, 20LNI324, 20SCE251, | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |
| Module-1 | | | |
| CHARACTERISTICS OF WSN Characteristic requirements for WSN - Challenges for WSNs – WSN vs Adhoc Networks - Sensor node architecture – Commercially available sensor nodes –Imote, IRIS, Mica Mote, EYES nodes, BTnodes, TelosB, Sunspot -Physical layer and transceiver design considerations in WSNs, Energy usage profile, Choice of modulation scheme, Dynamic modulation scaling, Antenna considerations. | | | |
| Module-2 | | | |
| MEDIUM ACCESS CONTROL PROTOCOLS Fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts – Contention based protocols - Schedule-based protocols - SMAC - BMAC - Traffic-adaptive medium access protocol (TRAMA) - The IEEE 802.15.4 MAC protocol. | | | |
| Module-3 | | | |
| ROUTING AND DATA GATHERING PROTOCOLS Routing Challenges and Design Issues in Wireless Sensor Networks, Flooding and gossiping – Data centric Routing – SPIN – Directed Diffusion – Energy aware routing - Gradient-based routing - Rumor Routing – COUGAR – ACQUIRE – Hierarchical Routing - LEACH, PEGASIS – Location Based Routing – GF, GAF, GEAR, GPSR – Real Time routing Protocols – TEEN, APTEEN, SPEED, RAP - Data aggregation - data aggregation operations - Aggregate Queries in Sensor Networks - Aggregation Techniques – TAG, Tiny DB. | | | |

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| Module-4 | | | | |
| EMBEDDED OPERATING SYSTEMS Operating Systems for Wireless Sensor Networks – Introduction - Operating System Design Issues - Examples of Operating Systems – TinyOS – Mate – MagnetOS – MANTIS - OSPM - EYES OS – SenOS – EMERALDS – PicOS – Introduction to Tiny OS – NesC – Interfaces and Modules- Configurations and Wiring - Generic Components -Programming in Tiny OS using NesC, Emulator TOSSIM. | | | | |
| Module-5 | | | | |
| APPLICATIONS OF WSN WSN Applications - Home Control - Building Automation - Industrial Automation - Medical Applications - Reconfigurable Sensor Networks - Highway Monitoring - Military Applications - Civil and Environmental Engineering Applications - Wildfire Instrumentation - Habitat Monitoring - Nanoscopic Sensor Applications – Case Study: IEEE 802.15.4 LR-WPANs Standard - Target detection and tracking - Contour/edge detection - Field sampling. | | | | |
| Course outcomes: At the end of the course the student will be able to: | | | | |
| <ul style="list-style-type: none"> • Know the basics , characteristics and challenges of Wireless Sensor Network • Apply the knowledge to identify appropriate physical and MAC layer protocol • Apply the knowledge to identify the suitable routing algorithm based on the network and user requirement • Be familiar with the OS used in Wireless Sensor Networks and build basic modules • Understand the applications of WSN in various fields | | | | |
| Question paper pattern: The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. | | | | |
| <ul style="list-style-type: none"> • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. | | | | |
| Textbook/ Textbooks | | | | |
| Sl No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
| 1 | Wireless Sensor Networks Technology, Protocols, and Applications | Kazem Sohraby, Daniel Minoli and Taieb Znati | John Wiley & Sons | 2007 |
| 2 | Protocols and Architectures for Wireless Sensor Network | Holger Karl and Andreas Willig | John Wiley & Sons, Ltd. | 2005 |
| Reference Books | | | | |
| 1 | A survey of routing protocols in wireless sensor networks | K. Akkaya and M. Younis | Elsevier Ad Hoc Network Journal | Vol. 3, no. 3, pp. 325--349 |
| 2 | TinyOS Programming | Philip Levis | | |
| 3 | Wireless Sensor Network Designs | Anna Ha'c | John Wiley & Sons Ltd. | |

| M.TECH COMPUTER NETWORK ENGINEERING (SCN) Choice Based Credit System (CBCS) and Outcome Based Education(OBE) SEMESTER - II | | | | |
|---|--------------------------------|----------------------|----------------|------------------|
| SOCIAL NETWORK ANALYSIS | | | | |
| Course Code | 20SCN252, 20LNI332, 20SFC333 | | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | | SEE Marks | 60 |
| Credits | 04 | | Exam Hours | 03 |
| Module-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. | | | | |
| Module 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. | | | | |
| Module 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. | | | | |
| Module 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 | | | | |
| Module 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. | | | | |
| Course outcomes: | | | | |
| At the end of the course the student will be able to: | | | | |
| <ul style="list-style-type: none"> • Define notation and terminology used in network science. • Demonstrate, summarize and compare networks. • Explain basic principles behind network analysis algorithms. • Analyzing real world network. | | | | |
| Question paper pattern: | | | | |
| The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. | | | | |
| <ul style="list-style-type: none"> • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. | | | | |
| Textbook/ Textbooks | | | | |
| SI No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
| 1 | Networks, Crowds, and Markets: | David Easley and | Cambridge | 2010 |

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|------------------------|---|---------------------------------------|----------------------------|------|
| | Reasoning About a Highly Connected World | John Kleinberg | University Press | |
| 2 | Statistical Analysis of Network Data with R | Eric Kolaczyk, Gabor Csardi | Springer | 2014 |
| 3 | Social Network Analysis. Methods and Applications | Stanley Wasserman and Katherine Faust | Cambridge University Press | 1994 |
| Reference Books | | | | |
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| M.TECH COMPUTER NETWORK ENGINEERING (SCN) | | | |
| Choice Based Credit System (CBCS) and Outcome Based Education(OBE) | | | |
| SEMESTER - II | | | |
| NETWORK MANAGEMENT | | | |
| Course Code | 20SCN253 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |
| Module-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- Communication Architectures, Protocol Layers and Services; Case Histories of Networking and Management – The Importance of topology , Filtering Does Not Reduce Load on Node, Some Common Network Problems; Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions- Goal of Network Management, Network Provisioning, Network Operations and the NOC, Network Installation and Maintenance; Network and System Management, Network Management System platform, Current Status and Future of Network Management. | | | |
| Module 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. | | | |
| Module 3 | | | |
| SNMPv1 Network Management: Managed Network: The History of SNMP Management, Internet Organizations and standards, Internet Documents, The SNMP Model, The Organization Model, System Overview. The Information Model – Introduction, The Structure of Management Information, Managed Objects, Management Information Base. The SNMP Communication Model – The SNMP Architecture, Administrative Model, SNMP Specifications, SNMP Operations, SNMP MIB Group, Functional Model SNMP Management – RMON: Remote Monitoring, RMON SMI and MIB, RMON1- RMON1 Textual Conventions, RMON1 Groups and Functions, Relationship Between Control and Data Tables, RMON1 Common and Ethernet Groups, RMON Token Ring Extension Groups, RMON2 – The RMON2 Management Information Base, RMON2 Conformance Specifications. | | | |
| Module 4 | | | |
| Broadband Network Management: Broadband Access Networks and Technologies: Broadband | | | |

Access Networks, Broadband Access Technology; HFCT Technology: The Broadband LAN, The Cable Modem, The Cable Modem Termination System, The HFC Plant, The RF Spectrum for Cable Modem; Data Over Cable, Reference Architecture; HFC Management – Cable Modem and CMTS Management, HFC Link Management, RF Spectrum Management, DSL Technology; Asymmetric Digital Subscriber Line Technology – Role of the ADSL Access Network in an Overall Network, ADSL Architecture, ADSL Channeling Schemes, ADSL Encoding Schemes; 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

Module-5

Network Management Applications: Configuration Management- Network Provisioning, Inventory Management, Network Topology, Fault Management- Fault Detection, Fault Location and Isolation 24 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 Breaches 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.

Course outcomes:

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

- Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets.
- Apply network management standards to manage practical networks
- Formulate possible approaches for managing OSI network model.
- Use on SNMP for managing the network
- Use RMON for monitoring the behavior of the network
- Identify the various components of network and formulate the scheme for the managing them

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

| Sl No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
|-------|---|----------------------|-------------------|------------------|
| 1 | Network Management- Principles and Practice | Mani Subramanian | Pearson Education | 2nd, 2010 |

Reference Books

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

| M.TECH COMPUTER NETWORK ENGINEERING (SCN) Choice Based Credit System (CBCS) and Outcome Based Education(OBE) SEMESTER - II | | | | |
|---|-----------------------------------|----------------------|----------------|------------------|
| OBJECT ORIENTED DESIGN | | | | |
| Course Code | 20SCN254, 20SCS252 | CIE Marks | 40 | |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 | |
| Credits | 04 | Exam Hours | 03 | |
| Module-1 | | | | |
| The Motivation for Object-Oriented Programming, Classes and Objects: The Building Blocks of the Object-Oriented Paradigm Topologies of Action-Oriented Versus Object-Oriented Applications, | | | | |
| Module-2 | | | | |
| The Relationships Between Classes and Objects The Inheritance Relationship | | | | |
| Module-3 | | | | |
| Multiple Inheritance, The Association Relationship, | | | | |
| Module-4 | | | | |
| Class-Specific Data and Behavior, Physical Object-Oriented Design, | | | | |
| Module-5 | | | | |
| The Relationship Between Heuristics and PatternsThe Use of Heuristics in Object-Oriented Design | | | | |
| Course outcomes: | | | | |
| At the end of the course the student will be able to: | | | | |
| <ul style="list-style-type: none"> • Identify the heuristics of the object oriented programming • Explain the fundamentals of OOP • Examine fine object oriented relations • Explain the role of <u>Physical Object-Oriented Design</u>, • <u>Make use of Heuristics in The Use of Heuristics in Object-Oriented Design</u> | | | | |
| Question paper pattern: | | | | |
| The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. | | | | |
| <ul style="list-style-type: none"> • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. | | | | |
| Textbook/ Textbooks | | | | |
| SI No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
| 1 | Object Oriented Desing Heuristics | Arthur J Riel | Addison-Wesley | 1996 |
| Reference Books | | | | |
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M.TECH COMPUTER NETWORK ENGINEERING (SCN)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - II

CLOUD COMPUTING

| | | | |
|-------------------------------|---|------------|----|
| Course Code | 20SCN31, 20LNI15, 20SCE14, 20SIT22, 20SSE251, 20SCS243 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |

Module-1

Introduction, Cloud Infrastructure: Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Energy use and ecological impact, Service level agreements, User experience and software licensing. Exercises and problems.

Module 2

Cloud Computing: Application Paradigms.: Challenges of cloud computing, Architectural styles of cloud computing, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper, The Map Reduce programming model, A case study: The Gre The Web application, Cloud for science and engineering, High-performance computing on a cloud, Cloud computing for Biology research, Social computing, digital content and cloud computing.

Module 3

Cloud Resource Virtualization: Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and paravirtualization, Hardware support for virtualization, Case Study: Xen a VMM based paravirtualization, Optimization of network virtualization, vBlades, Performance comparison of virtual machines, The dark side of virtualization, Exercises and problems

Module 4

Cloud Resource Management and Scheduling: Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based Web services, Resourcing bundling: Combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling MapReduce applications subject to deadlines, Resource management and dynamic scaling, Exercises and problems.

Module 5

Cloud Security, Cloud Application Development: Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor, Amazon web services: EC2 instances, Connecting clients to cloud instances through firewalls, Security rules for application and transport layer protocols in EC2, How to launch an EC2 Linux instance and connect to it, How to use S3 in java, Cloud-based simulation of a distributed trust algorithm, A trust management service, A cloud service for adaptive data streaming, Cloud based optimal

| | | | | |
|---|---|--------------------------------------|-----------------------|-------------------------|
| FPGA synthesis .Exercises and problems. | | | | |
| Course outcomes: At the end of the course the student will be able to: | | | | |
| <ul style="list-style-type: none"> • Compare the strengths and limitations of cloud computing • Identify the architecture, infrastructure and delivery models of cloud computing • Apply suitable virtualization concept. • Choose the appropriate cloud player • Address the core issues of cloud computing such as security, privacy and interoperability • Design Cloud Services • Set a private cloud | | | | |
| Question paper pattern: The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. | | | | |
| <ul style="list-style-type: none"> • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. | | | | |
| Textbook/ Textbooks | | | | |
| Sl No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
| 1 | Cloud Computing Theory and Practice | Dan C Marinescu | Elsevier(MK) | 2013. |
| Reference Books | | | | |
| 1 | Rajkumar Buyya , James Broberg, Andrzej Goscinski | Computing Principles and Paradigms | Wiley | 2014 |
| 2 | Cloud Computing Implementation, Management and Security | John W Rittinghouse, James F Ransome | CRC Press | 2013 |

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|--|-----------------|------------|----|
| M.TECH COMPUTER NETWORK ENGINEERING (SCN) | | | |
| Choice Based Credit System (CBCS) and Outcome Based Education(OBE) | | | |
| SEMESTER - III | | | |
| COMPUTER SYSTEMS PERFORMANCE ANALYSIS | | | |
| Course Code | 20SCN321 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |
| Module-1 | | | |
| Introduction: The art of Performance Evaluation; Common Mistakes in Performance Evaluation, A Systematic Approach to Performance Evaluation, Selecting an Evaluation Technique, Selecting Performance Metrics, Commonly used Performance Metrics, Utility Classification of Performance Metrics, Setting Performance Requirements. | | | |
| Module 2 | | | |

Workloads, Workload Selection and Characterization: Types of Workloads, addition instructions, Instruction mixes, Kernels; Synthetic programs, Application benchmarks, popular benchmarks. Work load Selection: Services exercised, level of detail; Representativeness; Timeliness, Other considerations in workload selection. Work load characterization Techniques: Terminology; Averaging, Specifying dispersion, Single Parameter Histograms, Multi Parameter Histograms, Principle Component Analysis, Markov Models, Clustering.

Module 3

Monitors, Program Execution Monitors and Accounting Logs: Monitors: Terminology and classification; Software and hardware monitors, Software versus hardware monitors, Firmware and hybrid monitors, Distributed System Monitors, Program Execution Monitors and Accounting Logs, Program Execution Monitors, Techniques for Improving Program Performance, Accounting Logs, Analysis and Interpretation of Accounting log data, Using accounting logs to answer commonly asked questions.

Module 4

Capacity Planning and Benchmarking: Steps in capacity planning and management; Problems in Capacity Planning; Common Mistakes in Benchmarking; Benchmarking Games; Load Drivers; Remote- Terminal Emulation; Components of an RTE; Limitations of RTEs. Experimental Design and Analysis: Introduction: Terminology, Common mistakes in experiments, Types of experimental designs, 2k Factorial Designs, Concepts, Computation of effects, Sign table method for computing effects; Allocation of variance; General 2k Factorial Designs, General full factorial designs with k factors: Model, Analysis of a General Design, Informal Methods.

Module 5

Queuing Models: Introduction: Queuing Notation; Rules for all Queues; Little's Law, Types of Stochastic Process. Analysis of Single Queue: Birth-Death Processes; M/M/1 Queue; M/M/m Queue; M/M/m/B Queue with finite buffers; Results for other M/M/1 Queuing Systems. Queuing Networks: Open and Closed Queuing Networks; Product form networks, queuing Network models of Computer Systems. Operational Laws: Utilization Law; Forced Flow Law; Little's Law; General Response Time Law; Interactive Response Time Law; Bottleneck Analysis; Mean Value Analysis and Related Techniques; Analysis of Open Queuing Networks; Mean Value Analysis; Approximate MVA; Balanced Job Bounds; Convolution Algorithm, Distribution of Jobs in a System, Convolution Algorithm for Computing $G(N)$, Computing Performance using $G(N)$, Timesharing Systems, Hierarchical Decomposition of Large Queuing Networks: Load Dependent Service Centers, Hierarchical Decomposition, Limitations of Queuing Theory.

Course outcomes:

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

- Identify the need for performance evaluation and the metrics used for it
- Implement Little's law and other operational laws
- Apply the operational laws to open and closed systems
- Use discrete-time and continuous-time Markov chains to model real world systems
- Develop analytical techniques for evaluating scheduling policies

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.

| | | | | |
|--|--|---------------------------------|-----------------------|-------------------------|
| <ul style="list-style-type: none"> • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. | | | | |
| Textbook/ Textbooks | | | | |
| Sl No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
| 1 | The Art of Computer Systems Performance Analysis, | Raj Jain | John Wiley and Sons | 2013 |
| Reference Books | | | | |
| 1 | Computer Systems Performance Evaluation and prediction | Paul J Fortier, Howard E Michel | Elsevier | 2003 |
| 2 | Probability and Statistics with Reliability, Queuing and Computer Science Applications | Trivedi K S | Wiley India | 2nd Edition, ,2001 |

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|--|--------------------|------------|----|
| M.TECH COMPUTER NETWORK ENGINEERING (SCN) Choice Based Credit System (CBCS) and Outcome Based Education(OBE) SEMESTER - III | | | |
| NETWORK ROUTING ALGORITHM | | | |
| Course Code | 20SCN322, 20LNI334 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |
| Module-1 | | | |
| NETWORK ROUTING: BASICS AND FOUNDATIONS: Networking and Network Routing: An Introduction: Addressing and Internet Service: An Overview, Network Routing: An Overview, IP Addressing, On Architectures, Service Architecture, Protocol Stack Architecture, Router Architecture, Network Topology Architecture, Network Management Architecture, Public Switched Telephone Network, Communication Technologies, Standards Committees, Last Two Bits. Routing Algorithms: Shortest Path and Widest Path: Bellman–Ford Algorithm and the Distance Vector Approach, Dijkstra’s Algorithm, Comparison of the Bellman–Ford Algorithm and Dijkstra’s Algorithm, Shortest Path Computation with Candidate Path Caching, Widest Path Computation with Candidate Path Caching, Widest Path Algorithm, k-Shortest Paths Algorithm Routing Protocols: Framework and Principles: Routing Protocol, Routing Algorithm, and Routing Table, Routing Information Representation and Protocol Messages, Distance Vector Routing Protocol, Link State Routing Protocol, Path Vector Routing Protocol, Link Cost | | | |
| Module -2 | | | |
| ROUTING IN IP NETWORKS: IP Routing and Distance Vector Protocol Family : Routers, Networks, and Routing Information: Some Basics, Static Routes, Routing Information Protocol, Version 1 (RIPv1), Routing Information Protocol, Version 2 (RIPv2), Interior Gateway Routing Protocol (IGRP), Enhanced Interior Gateway Routing Protocol (EIGRP), Route | | | |

Redistribution

OSPF and Integrated IS-IS :From a Protocol Family to an Instance of a Protocol, OSPF: Protocol Features, OSPF Packet Format, Examples of Router LSAs and Network LSAs, Integrated IS-IS, Similarities and Differences Between IS-IS and OSPF

Internet Routing Architectures: Internet Routing Evolution, Addressing and Routing: Illustrations, Current Architectural View of the Internet, Allocation of IP Prefixes and AS Number, Policy-Based Routing, Point of Presence, Traffic Engineering Implications, Internet Routing Instability

Module – 3

Router Architectures: Functions of a Router, Types of Routers, Elements of a Router, Packet Flow, Packet Processing: Fast Path versus Slow Path, Router Architectures. **IP Address Lookup Algorithms:** Impact of Addressing on Lookup, Longest Prefix Matching, Naïve Algorithms, Binary Tries, Multibit Tries, Compressing Multibit Tries, Search by Length Algorithms, Search by Value Approaches, Hardware Algorithms, Comparing Different Approaches. **IP Packet Filtering and Classification:** Importance of Packet Classification, Packet Classification Problem, Packet Classification Algorithms, Naïve Solutions, Two-Dimensional Solutions, Approaches for Dimensions, Extending Two-Dimensional Solutions, Divide and Conquer Approaches, Tuple Space Approaches, Decision Tree Approaches, Hardware-Based Solutions.

Module-4

ADVANCED ROUTING PROTOCOLS FOR WIRELESS NETWORKS: Wireless networking basic aspects, Basic routing concepts, Ad hoc routing, Mesh routing, Vehicular routing, Sensor routing

Module-5

TOWARD NEXT GENERATION ROUTING: Quality of Service Routing: QoS Attributes, Adapting Shortest Path and Widest Path Routing: A Basic Framework, Update Frequency, Information Inaccuracy, and Impact on Routing, Lessons from Dynamic Call Routing in the Telephone Network, Heterogeneous Service, Single-Link Case, A General Framework for Source-Based QoS Routing with Path Caching, Routing Protocols for QoS Routing
MPLS and GMPLS: Traffic Engineering Extension to Routing Protocols, Multiprotocol Label Switching, Generalized MPLS, MPLS Virtual Private Networks. **Routing and Traffic Engineering with MPLS:** Traffic Engineering of IP/MPLS Networks, VPN Traffic Engineering, Routing/Traffic Engineering for Voice Over MPLS. **VoIP Routing: Interoperability through IP and PSTN :** PSTN Call Routing Using the Internet, PSTN Call Routing: Managed IP Approach, IP-PSTN Interworking for VoIP, IP Multimedia Subsystem, Multiple Heterogeneous Providers Environment and All-IP Environment of VoIP Services.

Course outcomes:

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

- Given the network and user requirements and the type of channel over which the network has to operate, the student would be in a position to apply his knowledge for identifying a suitable routing algorithm, implementing it and analyzing its performance.
- The student would also be able to design a new algorithm or modify an existing algorithm to satisfy the evolving demands in the network and by the user applications.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

| SI No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
|-------|---|--|------------------------|------------------|
| 1 | Network Routing: Algorithms, Protocols, and Architectures | Deepankar Medhiand Karthikeyan Ramasamy | Elsevier | 2007 |
| 2 | Advanced Routing Protocols for Wireless Networks | Miguel Elias M. Campista and Marcelo G. Rubinstein | John Wiley & Sons, Inc | 2014 |

Reference Books

| | | | | |
|---|--|-------------------|------------------------------|----------------------|
| 1 | High speed networks and Internets Performance and Quality of Service”, 2nd Edition, Reprint India. | William Stallings | Pearson Education Asia. | 2002 |
| 2 | Routing in Communication network, | M. Steen Strub | Prentice –Hall International | 1995 |
| 3 | Network Analysis, Architecture, and Design | James D. McCabe | Elsevier Inc | 3 rd 2007 |

**M.TECH COMPUTER NETWORK ENGINEERING (SCN)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - III**

INFORMATION SECURITY POLICIES IN INDUSTRY

| | | | |
|----------------------------|--------------------|------------|----|
| Course Code | 20SCN323, 20SFC243 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |

Module-1

Introduction to Information Security Policies: About Policies, why Policies are Important, When policies should be developed, How Policy should be developed, Policy needs, Identify what and from whom it is being protected, Data security consideration, Backups, Archival storage and disposal of data, Intellectual Property rights and Policies, Incident Response and Forensics, Management Responsibilities, Role of Information Security Department, Security Management and Law Enforcement, Security awareness training and support.

Module 2

Policy Definitions, Standards, Guidelines, Procedures with examples, Policy Key elements,

Policy format and Basic Policy Components, Policy content considerations, Program Policy Examples, Business Goal Vs Security Goals, Computer Security Objectives, Mission statement Format, Examples, Key roles in Organization, Business Objectives, Standards: International Standards.

Module 3

Writing The Security Policies: Computer location and Facility construction, Contingency Planning, Periodic System and Network Configuration Audits, Authentication and Network Security, Addressing and Architecture, Access Control, Login Security, Passwords, User Interface, Telecommuting and Remote Access, Internet Security Policies, Administrative and User Responsibilities, WWW Policies, Application Responsibilities, E-mail Security Policies.

Module 4

Establishing Type of Viruses Protection: Rules for handling Third Party Software, User Involvement with Viruses, Legal Issues, Managing Encryption and Encrypted data, Key Generation considerations and Management, Software Development policies, Processes Testing and Documentation, Revision control and Configuration management, Third Party Development, Intellectual Property Issues.

Module 5

Maintaining the Policies: Writing the AUP, User Login Responsibilities, Organization's responsibilities and Disclosures, Compliance and Enforcement, Testing and Effectiveness of Policies, Publishing and Notification Requirements of the Policies, Monitoring, Controls and Remedies, Administrator Responsibility, Login Considerations, Reporting of security Problems, Policy Review Process, The Review Committee, Sample Corporate Policies, Sample Security Policies.

Course outcomes:
At the end of the course the student will be able to:

- Explain the content, need, and responsibilities of information security policies.
- Explain the standards, guidelines, Procedures, and key roles of the organization.
- Able to write policy document for securing network connection and interfaces.
- Explain the threats to the stored data or data in transit and able to write policy document.
- Able to write, monitor, and review policy document.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

| Textbook/ Textbooks | | | | | | |
|----------------------------|--------------------------|---------------|------------|-----------------------------|-----------------------|-------------------------|
| Sl No | Title of the book | | | Name of the Author/s | Publisher Name | Edition and year |
| 1 | Writing | Information | Security | Scott Barman | Sams Publishing | 2002 |
| 2 | Information | Policies | Procedures | Thomas.R.Peltier | CRC Press | 2004 |
| | | and Standards | | | | |

| Reference Books | | | | |
|-----------------|--|--|-----------------------|-------------------|
| 1 | Information Security Fundamentals | Thomas R Peltier, Justin Peltier, John Backley | CRC Press, | 2005 |
| 2 | Information Security Management Handbook | Harold F. Tipton and Micki Krause | Auerbach publications | 5th Edition, 2005 |

| M.TECH COMPUTER NETWORK ENGINEERING (SCN) Choice Based Credit System (CBCS) and Outcome Based Education(OBE) SEMESTER - III MACHINE LEARNING TECHNIQUES | | | |
|--|--|------------|----|
| Course Code | 20SCN324, 20LNI322, 20SCE321, 20SFC254, 20SIT322 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |
| Module-1 | | | |
| INTRODUCTION, CONCEPT LEARNING AND DECISION TREES Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Version Spaces and Candidate Elimination Algorithm – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search | | | |
| Module -2 | | | |
| NEURAL NETWORKS AND GENETIC ALGORITHMS: Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning. | | | |
| Module – 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. | | | |
| Module-4 | | | |
| INSTANT BASED LEARNING AND LEARNING SET OF RULES: 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 | | | |
| Module-5 | | | |
| ANALYTICAL LEARNING AND REINFORCED LEARNING: Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning | | | |
| Course outcomes: At the end of the course the student will be able to: | | | |
| <ul style="list-style-type: none"> • Choose the learning techniques with this basic knowledge. • Apply effectively neural networks and genetic algorithms for appropriate applications. • Apply bayesian techniques and derive effectively learning rules. • Choose and differentiate reinforcement and analytical learning techniques | | | |

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|---|--------------------------------------|--|-----------------------|---------------------------|
| Question paper pattern: The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. | | | | |
| <ul style="list-style-type: none"> • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. | | | | |
| Textbook/ Textbooks | | | | |
| Sl No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
| 1 | Machine Learning | Tom M. Mitchell | McGraw-Hill Education | 2013 |
| Reference Books | | | | |
| 1 | Introduction to Machine Learning | Ethem Alpaydin | PHI Learning Pvt. Ltd | 2 nd Ed., 2013 |
| 2 | The Elements of Statistical Learning | T. Hastie, R. Tibshirani, J. H. Friedman | Springer | 1st edition, 2001 |

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| M.TECH COMPUTER NETWORK ENGINEERING (SCN) Choice Based Credit System (CBCS) and Outcome Based Education(OBE) SEMESTER - III | | | |
| ANALYSIS OF COMPUTER NETWORKS | | | |
| Course Code | 20SCN331 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |
| Module-1 | | | |
| Introduction: Two examples of analysis: Efficient transport of packet voice calls, Achievable throughput in an input-queuing packet switch; the importance of quantitative modeling in the Engineering of Telecommunication Networks. | | | |
| Module -2 | | | |
| Multiplexing: Network performance and source characterization; Stream sessions in a packet network: Delay guarantees; Elastic transfers in a packet network; Packet multiplexing over Wireless networks. | | | |
| Module – 3 | | | |
| Stream Sessions: Deterministic Network Analysis: Events and processes in packet multiplexer models: Universal concepts; Deterministic traffic models and Network Calculus; Scheduling; Application to a packet voice example; Connection setup: The RSVP approach; Scheduling (continued). | | | |
| Module-4 | | | |
| Stream Sessions: Stochastic Analysis: Deterministic analysis can yield loose bounds; Stochastic traffic models; Additional notation; Performance measures; Little’s theorem, Brumelle’s theorem, and applications; Multiplexer analysis with stationary and ergodic traffic; The effective | | | |

bandwidth approach for admission control; Application to the packet voice example; Stochastic analysis with shaped traffic; Multihop networks; Long-Range-Dependent traffic

Module-5

Adaptive Bandwidth Sharing for Elastic Traffic: Elastic transfers in a Network; Network parameters and performance objectives; sharing a single link; Rate-Based Control; Window-Based Control: General Principles; TCP: The Internet's Adaptive Window Protocol; Bandwidth sharing in a Network.

Course outcomes:

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

- List and classify network services, protocols and architectures, explain why they are layered.
- Implement key Internet applications and their protocols, and will apply to develop their own applications (e.g. Client Server applications, Web Services) using the sockets API.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

| SI No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
|-------|---|--------------------------------------|----------------|------------------|
| 1 | Communication Networking An Analytical Approach | Anurag Kumar, D. Manjunath, Joy Kuri | Elsevier | 2004 |

Reference Books

| | | | | |
|---|---|------------------------|-----------------|-------------------|
| 1 | Broadband Integrated Networks | M. Schwartz | Prentice Hall | 1996 |
| 2 | High Performance Communication Networks | J. Walrand, P. Varaiya | Morgan Kaufmann | 2nd Edition, 1999 |

| M.TECH COMPUTER NETWORK ENGINEERING (SCN) Choice Based Credit System (CBCS) and Outcome Based Education(OBE) SEMESTER - III PROTOCOL ENGINEERING | | | |
|--|-------------------|------------|----|
| Course Code | 20SCN332, 20LNI23 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |
| Module-1 | | | |
| Introduction: Communication Model, Communication Software, Communication Subsystems, Communication Protocol, Communication Protocol Development Methods, Protocol Engineering Process. Layered Architecture, Network Services and Interfaces, Protocol Function, OSI Model, TCP/IP Protocol Suite, Application Protocols, Protocol Specification: Components | | | |

| | | | | |
|---|------------------------------------|-----------------------------|-----------------------|-------------------------|
| of Protocol to be Specified, Communication Service Specification, Protocol Entity Specification, Interface Specifications, Multimedia Protocol Specifications, Internet Protocol Specifications: Examples | | | | |
| Module -2 | | | | |
| SDL: Examples of SDL Based Protocol Specifications Introduction to Other Protocol Specification Languages. | | | | |
| Module – 3 | | | | |
| Protocol Verification/Validation: Protocol Verification, Verification of a Protocol Using Finite State Machines, Protocol Validation, Protocol Design Errors, Protocol Validation Approaches, and SDL based Protocol Verification, SDL based Protocol Validation | | | | |
| Module-4 | | | | |
| Protocol Conformance Testing: Conformance Testing, Conformance Testing Methodology and Framework, Conformance Test Architectures, Test Sequence Generation Methods, Distributed Architecture by Local Methods, Conformance Testing with TTCN, Conformance Testing in Systems with Semi-controllable Interfaces, Conformance Testing of RIP, Multimedia Applications Testing, SDL Based Tools for Conformance Testing, SDL Based Conformance Testing of MPLS. | | | | |
| Module-5 | | | | |
| Protocol Synthesis: Protocol Synthesis, Interactive Synthesis Algorithm, Automatic Synthesis Algorithm, Automatic Synthesis of SDL from MSC, Protocol Re-synthesis. Protocol Implementation: Requirements of Protocol Implementation, Object based approach to Protocol Implementation, Protocol Compilers, and Tools for Protocol Engineering. | | | | |
| Course outcomes: | | | | |
| At the end of the course the student will be able to: | | | | |
| <ul style="list-style-type: none"> • Describe the requirements for protocol engineering systems • Explain the challenges in designing protocol engineering systems • Implement the design using SDL | | | | |
| Question paper pattern: | | | | |
| The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60. | | | | |
| <ul style="list-style-type: none"> • The question paper will have ten full questions carrying equal marks. • Each full question is for 20 marks. • There will be two full questions (with a maximum of four sub questions) from each module. • Each full question will have sub question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module. | | | | |
| Textbook/ Textbooks | | | | |
| Sl No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
| 1 | Communication Protocol Engineering | Venkataram & Manvi et. al. | PHI Learning Pvt. Ltd | 2004 |
| Reference Books | | | | |
| 1 | Communication Protocol Engineering | Miroslav Popovic | CRC Press | 2006 |
| 2 | Protocol Engineering | Konig, Hartmut | Springer | 2012 |

**M.TECH COMPUTER NETWORK ENGINEERING (SCN)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - III**

WEB ENGINEERING

| | | | |
|-------------------------------|--------------------|------------|----|
| Course Code | 20SCN333, 20SIT324 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |

Module-1

Introduction: Motivation, Categories of web applications, Characteristics of web applications. Requirements Engineering: Introduction, Fundamentals, RE specifics in web engineering, Principles of RE for web applications, Adapting RE methods to web application development, Outlook. Modeling Web Application: Introduction, Fundamentals, Modeling specifics in web engineering, Modeling requirements, Content modeling, Hypertext modeling, Presentation modeling, Customization modeling, Methods and tools, Outlook.

Module -2

Web Application Architectures: Introduction, Fundamentals, Specifics of web application architectures, Components of a generic web application architecture, Layered architectures, Data-aspect architectures. Technology-Aware Web Application Design: Introduction, Web design from an evolutionary perspective, Presentation design, Interaction design, Functional design, Outlook. Technologies for Web Applications: Introduction, Fundamentals, Client/Server communication on the web, Client side technologies, Document-specific technologies, Server-side technologies, Outlook.

Module – 3

Testing Web Applications: Introduction, Fundamentals, Testing specifics in web engineering, Test approaches, Test scheme, Test methods and techniques, Test automation, Outlook. Operation and Maintenance of Web Applications: Introduction, Challenges following the launch of a web application, Content management, Usage analysis, Outlook. Web Project Management: From software project management to web project management, Challenges in web project management, Managing web teams, Managing the development process of a web application, Outlook.

Module-4

The Web Application Development Process: Motivation, Fundamentals, Requirements for a web application development process, Analysis of the rational unified process, Analysis of extreme programming, Outlook. Usability of Web Applications: Motivation, What is usability? What characterizes the usability of web applications? Design guidelines, Web usability engineering methods, Web usability engineering trends, Outlook.

Module-5

Course outcomes:

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

- Ability to Model the requirements of a web application.
- Contrast technology-aware Web Application.
- Ability to analyze the performances of web applications

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.

- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

| Textbook/ Textbooks | | | | |
|----------------------------|--|---|-----------------------|-------------------------|
| Sl No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
| 1 | Web Engineering | Gerti Kappel, Birgit Proll, SiegfriedReich, Werner Retschitzegeer | Wiley India | 2007 |
| Reference Books | | | | |
| 1 | Web Engineering: A Practitioner's Approach | Roger Pressman, David Lowe | McGraw Hill | 2008 |

| M.TECH COMPUTER NETWORK ENGINEERING (SCN) | | | |
|---|-----------------|------------|----|
| Choice Based Credit System (CBCS) and Outcome Based Education(OBE) | | | |
| SEMESTER - III | | | |
| WEB MINING | | | |
| Course Code | 20SCN334 | CIE Marks | 40 |
| TeachingHours/Week (L:T:P) | 4:0:0 | SEE Marks | 60 |
| Credits | 04 | Exam Hours | 03 |
| Module-1 | | | |
| INTRODUCTION: Crawling and Indexing, Topic Directories, Clustering and Classification, Hyperlink Analysis, Resource Discovery and VerticalPortals, Structured vs. Unstructured DataMining . INFRASTRUCTURE and WEB SEARCH -- Crawling the web – HTML and HTTP Basics – Crawling Basics – Engineering Large ScaleCrawlers- Putting together a Crawler- Boolean Queries and the Inverted Index – RelevanceRanking – Similarity Search. | | | |
| Module -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 | | | |
| Module – 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. | | | |
| Module-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.

Module-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 – Resource Discovery – Collecting Important Pages Preferentially – Similarity Search Using Link Topology – Topical Locality and Focused Crawling – Discovering Communities- The Future of Web Mining.

Course outcomes:

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

- Identify the application areas for web content mining, web structure mining and webusage mining.
- Design to retrieval the web data
- Develop schemes to crawl the web data, organize and index
- Cluster the documents for fast access
- Develop algorithms used by web mining applications.
- Select between different approaches and techniques of web mining

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

| Sl No | Title of the book | Name of the Author/s | Publisher Name | Edition and year |
|-------|--|----------------------|------------------|------------------|
| 1 | Text Mining: Predictive Methods for Analyzing Unstructured Information | Sholom Weiss | Springer | 2005 |
| 2 | Mining the Web: Discovery Knowledge from Hypertext Data | Soumen Chakrabarti | Elsevier Science | 2003 |

Reference Books

| | | | | |
|---|---|---------------------------------|--------------------------------------|------|
| 1 | Handbook of Research on Text and Web Mining Technologies”, Vol I & II | Min Song, Yi-fang Brrok Wu | Information Science Reference (IGI), | 2009 |
| 2 | Insight into Data Mining Theory and Practice | K.P.Soman, ShyamDiwakar, V.Ajay | Prentice Hall of India | 2006 |
| 3 | Web Mining Applications and Techniques | Anthony Scime | Idea Group Publishing | 2005 |
| 4 | DATA MINING - Introductory and Advanced Concepts | Margret H.Dunham | PearsonEducation | 2003 |