

<b>ADVANCES IN OPERATING SYSTEMS</b>			
Course Code	<b>MSCS201</b>	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
<b>Course Learning objectives:</b>			
<ul style="list-style-type: none"> <li>Analyze the characteristics of operating systems for multiprocessor and multicomputer architectures.</li> <li>Understand and address the challenges related to designing operating systems.</li> <li>Explore the latest trends in developing mobile operating systems.</li> <li>Evaluate the implications of these trends on performance and user experience.</li> </ul>			
<b>Module-1</b>			
Multiprocessor Operating Systems: System Architectures- Structures of OS – OS design issues – Process synchronization – Process Scheduling and Allocation- Memory Management.			
<b>Teaching-Learning Process</b>	Chalk and board and PPT		
<b>Module-2</b>			
Distributed Operating Systems: System Architectures- Design issues – Communication models – clock synchronization – mutual exclusion – election algorithms- Distributed Deadlock detection.			
<b>Teaching-Learning Process</b>	Chalk and board and PPT		
<b>Module-3</b>			
Distributed scheduling - Distributed shared memory - Distributed File system – Multimedia file systems - File placement – Caching.			
<b>Teaching-Learning Process</b>	Chalk and board and PPT		
<b>Module-4</b>			
Database Operating Systems: Requirements of Database OS – Transaction process model – Synchronization primitives - Concurrency control algorithms.			
<b>Teaching-Learning Process</b>	Chalk and board and PPT		
<b>Module-5</b>			
Mobile Operating Systems: ARM and Intel architectures - Power Management - Mobile OS Architectures - Underlying OS - Kernel structure and native level programming - Runtime issues- Approaches to power management.			
<b>Teaching-Learning Process</b>	Chalk and board and PPT		

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**Continuous Internal Evaluation:**

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks** or **one Skill Development Activity of 50 marks** to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

**CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester-End Examination:**

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

**Suggested Learning Resources:****Books**

1. M Singhal and NG Shivaratri , Advanced Concepts in Operating Systems, Tata McGraw Hill Inc, 2001

**Reference Book**

1. A S Tanenbaum, Distributed Operating Systems, Pearson Education Asia, 2001
2. Source Wikipedia, Mobile Operating Systems, General Books LLC, 2010

**Skill Development Activities Suggested**

- The students with the help of the course teacher can take up relevant technical – activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

**Course outcome (Course Skill Set)**

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

Sl.No.	Description	BloomsLevel
CO1	Analyze the characteristics of operating systems for multiprocessor and multicomputer architectures.	L2
CO2	Understand and address the challenges related to designing operating systems and their implications.	L3
CO3	Explore the latest trends in developing mobile operating systems and evaluate their impact on performance.	L4

**Program Outcome of this course :**

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

**Mapping of COS and POs:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	x		x									
CO2	x	x		x	x		x					
CO3	x		x	x								

<b>Advances in Computer Networks</b>			
Course Code	MSCN202	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<b>Course Learning objectives:</b>			
<ul style="list-style-type: none"> <li>Students will be able to explain various network protocols of their respective layers.</li> </ul>			
<b>Module-1</b>			
<b>Foundation:</b> 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.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
<b>Internetworking I:</b> 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.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
<b>Internetworking- II:</b> 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			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
<b>End-to-End Protocols:</b> 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			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-5</b>			
<b>Congestion Control and Resource Allocation</b> 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)			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		

### **Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

#### **Continuous Internal Evaluation:**

1. Two Unit Tests each of 25 Marks
2. Two assignments each of 25 Marks or one Skill Development Activity of 50 marks to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be scaled down to 50 marks CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

#### **Semester End Examination:**

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

#### **Suggested Learning Resources:**

##### **Text Books:**

1. *Computer Networks: A System Approach*, Larry Peterson and Bruce S Davis, Elsevier, 5<sup>th</sup> 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*, Uyles Black, PHI, 2<sup>nd</sup> Edition
2. *TCP/IP Protocol Suite*, Behrouz A Forouzan, Tata McGraw-Hill, 4<sup>th</sup> Edition

#### **Web links and Video Lectures (e-Resources):**

- <https://www.udemy.com/course/computer-networks-for-beginners-from-zero-to-hero/>
- <https://www.youtube.com/watch?v=f5ksLu5Xjnk&list=PLG9aCp4uE-s3Mmbn4q5J87OriIN3CuFDS>
- <https://sites.google.com/site/computernetworksfall2009/course-outline>

#### **Skill Development Activities Suggested**

- The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

**Course outcome (Course Skill Set)**

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

Sl. No.	Description	Blooms Level
C01	List and classify network services, protocols and architectures, explain why they are layered.	L1
C02	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.	L3
C03	Develop effective communication mechanisms using techniques like connection establishment, queuing theory, recovery Etc.	L2

**Program Outcome of this course**

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

**Mapping of COS and POs**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>C01</b>	<b>x</b>			<b>x</b>								
<b>C02</b>			<b>x</b>		<b>x</b>							
<b>C03</b>		<b>x</b>	<b>x</b>									

<b>Blockchain Technology</b>			
Course Code	MSCN203	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:1	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	04	Exam Hours	03
<b>Course Learning objectives:</b>			
<ul style="list-style-type: none"> <li>To explore the driving force behind the cryptocurrency Bitcoin. Along with the Decentralization,</li> </ul>			
<b>Module-1</b>			
Blockchain 101: Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
Decentralization and Cryptography: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations. Cryptography and Technical Foundations: Cryptographic primitives, Asymmetric cryptography, Public and private keys			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
Bitcoin and Alternative Coins A: Bitcoin, Transactions, Blockchain, Bitcoin payments B: Alternative Coins, Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
Smart Contracts and Ethereum 101: Smart Contracts: Definition, Ricardian contracts. Ethereum 101:Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-5</b>			
Alternative Blockchains: Blockchains Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		



### Assessment Details (both CIE and SEE)

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#### Continuous Internal Evaluation:

1. Two Unit Tests each of 25 Marks

2. Two assignments each of 25 Marks or one Skill Development Activity of 50 marks to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be scaled down to 50 marks CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

#### Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

#### Suggested Learning Resources:

##### Text Books:

1. *Bitcoin and Cryptocurrency Technologies*, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Princeton University, 2016

##### Reference Books:

1. *Blockchain Basics: A Non-Technical Introduction in 25 Steps*, Daniel Drescher, Apress, First Edition, 2017
2. *Mastering Bitcoin: Unlocking Digital Cryptocurrencies*, Andreas M. Antonopoulos, O'Reilly Media, First Edition, 2014

#### Web links and Video Lectures (e-Resources):

- <https://nptel.ac.in/courses/106105184>
- [https://ocw.mit.edu/courses/15-s12-blockchain-and-money-fall-2018/video\\_galleries/video-lectures/](https://ocw.mit.edu/courses/15-s12-blockchain-and-money-fall-2018/video_galleries/video-lectures/)

#### Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

#### Course outcome (Course Skill Set)

Sl. No.	Description	Blooms Level
CO1	Interpret the types, benefits and limitation of blockchain.	L1
CO2	Explore the blockchain decentralization and cryptography concepts.	L2
CO3	Enumerate the Bitcoin features and its alternative options.	L1

## Program Outcome of this course

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
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5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
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8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
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11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

**Mapping of COS and POs**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>C01</b>			<b>x</b>							<b>x</b>		
<b>C02</b>							<b>x</b>					<b>x</b>
<b>C03</b>			<b>x</b>			<b>x</b>						
<b>C04</b>	<b>x</b>	<b>x</b>			<b>x</b>							

<b>Wireless Ad hoc Networks</b>			
Course Code	MSCN214A	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<b>Course Learning objectives:</b>			
<ul style="list-style-type: none"> <li>• Explain fundamental principles of Ad-hoc Networks</li> <li>• Discuss a comprehensive understanding of Ad-hoc network protocols</li> <li>• Outline current and emerging trends in Ad-hoc Wireless Networks.</li> <li>• Analyze energy management in ad-hoc wireless networks</li> </ul>			
<b>Module-1</b>			
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.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
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; OnDemand Routing Protocols, Hybrid Routing Protocols, Hierarchical Routing Protocols and Power-Aware Routing Protocols.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
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.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
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			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-5</b>			
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			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		

<b>Process</b>														
<p><b>Assessment Details (both CIE and SEE)</b></p> <p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.</p> <p><b>Continuous Internal Evaluation:</b></p> <ol style="list-style-type: none"> <li>1. Two Unit Tests each of 25 Marks</li> <li>2. Two assignments each of 25 Marks or one Skill Development Activity of 50 marks to attain the COs and POs</li> </ol> <p>The sum of two tests, two assignments/skill Development Activities, will be scaled down to 50 marks CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.</p> <p><b>Semester End Examination:</b></p> <ol style="list-style-type: none"> <li>1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.</li> <li>2. The question paper will have ten full questions carrying equal marks.</li> <li>3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.</li> <li>4. Each full question will have a sub-question covering all the topics under a module.</li> <li>5. The students will have to answer five full questions, selecting one full question from each module</li> </ol>														
<p><b>Suggested Learning Resources:</b></p> <p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. C. Siva Ram Murthy &amp; B. S. Manoj. Ad-hoc Wireless Networks. Pearson Education, 2<sup>nd</sup> Edition, 2011.</li> <li>2. Ozan K. Tonguz and Gianguigi Ferrari. Ad-hoc Wireless Networks, John Wiley, 2011.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Xiuzhen Cheng, Xiao Hung, DingZhu Du. Ad-hoc Wireless Networking. Kluwer Academic Publishers, 2004.</li> <li>2. C.K. Toh, Ad-hoc Mobile Wireless Networks- Protocols and Systems. Pearson Education, 2002.</li> </ol>														
<p><b>Web links and Video Lectures (e-Resources):</b></p>														
<ul style="list-style-type: none"> <li>• <a href="https://study.com/academy/topic/ad-hoc-wireless-networks.html">https://study.com/academy/topic/ad-hoc-wireless-networks.html</a></li> <li>• <a href="https://www.youtube.com/watch?v=ycaz99NogS4&amp;list=PLJ5C_6qdAvBHroAfekCO7K4xphEF74UPc">https://www.youtube.com/watch?v=ycaz99NogS4&amp;list=PLJ5C_6qdAvBHroAfekCO7K4xphEF74UPc</a></li> </ul>														
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<p><b>Course outcome (Course Skill Set)</b></p> <p>At the end of the course the student will be able to :</p>														
<table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Description</th> <th>Blooms Level</th> </tr> </thead> <tbody> <tr> <td>CO1</td> <td>Defend and critically analyze research, both in writing and verbally.</td> <td>L2</td> </tr> <tr> <td>CO2</td> <td>Examine the existing network and improve its quality of service</td> <td>L2</td> </tr> <tr> <td>CO3</td> <td>Analyze energy consumption and management</td> <td>L2</td> </tr> </tbody> </table>	Sl. No.	Description	Blooms Level	CO1	Defend and critically analyze research, both in writing and verbally.	L2	CO2	Examine the existing network and improve its quality of service	L2	CO3	Analyze energy consumption and management	L2		
Sl. No.	Description	Blooms Level												
CO1	Defend and critically analyze research, both in writing and verbally.	L2												
CO2	Examine the existing network and improve its quality of service	L2												
CO3	Analyze energy consumption and management	L2												

## Program Outcome of this course

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	P02
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	P03
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	P04
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	P05
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	P06
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	P07
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	P08
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	P09
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	P010
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	P011
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	P012

### Mapping of COS and Pos

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
<b>C01</b>			<b>x</b>		<b>x</b>							
<b>C02</b>				<b>x</b>	<b>x</b>							
<b>C03</b>		<b>x</b>					<b>x</b>					

## ADVANCES IN STORAGE AREA NETWORK

Course Code	MSCN214B	CIE Marks	50
Teaching Hours/Week (L:P:S)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

### Course Learning objectives:

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

- To Identify the need for performance evaluation and the metrics used for it
- To Apply the techniques used for data maintenance.
- To Realize strong virtualization concepts

### 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.

#### Teaching Learning Process

Chalk and talk/PPT/case study/web content

### 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.

#### Teaching Learning Process

Chalk and talk/PPT/case study/web content

### 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.

#### Teaching Learning Process

Chalk and talk/PPT/case study/web content

### 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.

#### Teaching Learning Process

Chalk and talk/PPT/case study/web content

### 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

#### Teaching Learning Process

Chalk and talk/PPT/case study/web content

### Course outcomes:

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

The students should be able to:

- Identify the need for performance evaluation and the metrics used for it
- Apply the techniques used for data maintenance.
- Realize strong virtualization concepts

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- Develop techniques for evaluating policies for LUN masking, file systems

### Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

### Continuous Internal Evaluation:

1. Two Unit Tests each of 25 Marks
2. Two assignments each of 25 Marks or one Skill Development Activity of 50 marks to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be scaled down to 50 marks. CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

### Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a 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



Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
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4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

#### Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1			X				X			
CO2	X							X		X
CO3					X				X	

**INTERNET OF THINGS AND APPLICATIONS**

Course Code	MSCN214C	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

**Course Learning objectives:**

- Able to interpret the application areas of IOT ·
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks ·
- Able to interpret building blocks of Internet of Things and characteristics.

**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, OverThe-Air-Passive Surveillance/Ring of Steel, Control Application Examples, Myriad Other Applications.

<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content
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**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

<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content
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**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 Tunnelling, IPsec in IPv6, Header Compression Schemes, Quality of Service in IPv6, Migration Strategies to IPv6.

<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content
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**Module-4**

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

<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content
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**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.

<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content
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**Assessment Details (both CIE and SEE)**

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**Continuous Internal Evaluation:**

1. Two Unit Tests each of 25 Marks

2. Two assignments each of 25 Marks or one Skill Development Activity of 50 marks to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be scaled down to 50 marks CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

**Semester End Examination:**

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

**Suggested Learning Resources:****Text Books:**

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

**Web links and Video Lectures (e-Resources):**

- <https://www.coursera.org/specializations/internet-of-things>
- <https://www.youtube.com/watch?v=Ic63-yf-zuc&list=PL3uLubnzL2Tm5PAw88N1jR9MLTJpuPEnX>

**Skill Development Activities Suggested**

- The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

**Course outcome (Course Skill Set)**

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

Sl. No.	Description	Blooms Level
C01	Develop schemes for the applications of IOT in real time scenarios	L3
C02	Manage the Internet resources	L1
C03	Model the Internet of things to business	L2

**Skill Development Activities Suggested**

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill.

**Course outcome (Course Skill Set)**

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

Sl. No.	Description	Blooms Le
CO1	Implement fundamental image processing techniques required for computer vision	L3
CO2	Perform shape analysis	L2
CO3	Implement boundary tracking techniques	L3
CO4	Apply chain codes and other region descriptors	L3
CO5	Apply Hough Transform for line, circle, and ellipse detections.	L2

**Mapping of COS and POs**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2
CO1	x		x									
CO2	x	x										
CO3	x		x									
CO4	x		x									
CO5	x	x										

**Program Outcome of this course**

5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

<b>Software Defined Networks</b>			
Course Code	MSCN214D	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<b>Course Learning objectives:</b>			
<ul style="list-style-type: none"> <li>Differentiate and evaluate Software Defined Networking Architectures, Controller Environments, Application Programming Interfaces and Platforms.</li> <li>Use tools for modelling Software Defined Networks.</li> <li>Use case scenarios to explain Network Function Virtualization technologies, applications and benefits.</li> <li>Present project investigation, design and implementation to technical and lay audience.</li> </ul>			
<b>Module-1</b>			
Introduction, Centralized and Distributed Control and Data Planes, OpenFlow			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
SDN Controllers, Network Programmability			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
Data Center Concepts and Constructs, Network Function Virtualization			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
Network Topology and Topological Information Abstraction, Building an SDN Framework			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-5</b>			
Use Cases for Bandwidth Scheduling, Manipulation, and Calendaring, Use Cases for Input Traffic Monitoring, Classification, and Triggered Actions			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		

### Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

#### Continuous Internal Evaluation:

1. Two Unit Tests each of 25 Marks

2. Two assignments each of 25 Marks or one Skill Development Activity of 50 marks to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be scaled down to 50 marks CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

#### Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

#### Suggested Learning Resources:

##### Text Books:

1. *SDN: Software Defined Networks*, Ken Gray, Thomas D. Nadeau. O'Reilly. 2013.

##### Reference Books:

1. *Software Defined Networks*, Paul Goransson Chuck Black Timothy Culver. Elsevier. 2nd Edition 2016.

#### Web links and Video Lectures (e-Resources):

- <https://www.coursera.org/learn/sdn>
- <https://www.udemy.com/course/sdn-made-simple/>

#### Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

#### Course outcome (Course Skill Set)

Sl. No.	At the end of the course the student will be able	Blooms Level
CO1	Illustrate the concepts of controllers and network programmability	L2
CO2	Explain data center and NFV	L1
CO3	Report use case	L2
CO4	Build an SDN framework	L3

## Program Outcome of this course

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	P02
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	P03
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	P04
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	P05
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	P06
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	P07
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	P08
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	P09
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	P010
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	P011
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	P012

### Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01		x		x								
C02		x								x		
C03	x						x					
C04			x		x							



<b>NETWORK PROTOCOL DESIGN</b>			
Course Code	MSCN215A	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<b>Course Learning objectives:</b>			
<ul style="list-style-type: none"> <li>Recognize computer networks.</li> <li>Recognize essential computer network protocols.</li> <li>Constitute a computer network.</li> <li>Manage a computer network.</li> </ul>			
<b>Module-1</b>			
How to specify network protocols? Semantics of traditional protocol specifications, syntax of traditional protocol. Network processes constants, inputs, and variables. Specifications in new protocol, A vending machine protocol, a request/reply protocol, a Manchester encoding protocol. Current internet			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
Protocol execution processes in the internet. Nondeterministic assignment process arrays, protocol process communication in the internet, Types of transmission errors. Error occurrence. Normal timeout actions implementing transmission errors in the internet connections: using timeouts connections, using identifiers full-duplex and half-duplex connections. Connections in the internet.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
Detection of message corruption. Detection of message loss, detection of message reorder, error detection in the internet. Error recovery-forward & backward error recovery. Cumulative acknowledgment, individual acknowledgment, blocks acknowledgment error recovery in the internet flow control. Window size control, rate control, circular buffer control, flow control in the internet.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
Local and global topology information, maintaining local topology information, hierarchical topology information topology information in the internet, Abstraction of perfect channel in the internet, Hierarchical routing, random routing.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-5</b>			
Asymmetric and symmetric keys authentication. Privacy and integrity non-repudiation authorization. Message digest security in the internet data compression. Huffman coding, static Huffman compression, dynamic Huffman compression. Context sensitive compression, lossy compression, data compression in the internet.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		

### Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

#### Continuous Internal Evaluation:

1. Two Unit Tests each of 25 Marks
2. Two assignments each of 25 Marks or one Skill Development Activity of 50 marks to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be scaled down to 50 marks CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

#### Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

#### Suggested Learning Resources:

##### Text Books:

1. *Elements of Network Protocol Design*, Mohamed G. Gouda. John Wiley & Sons, 2004.

##### Refence Books:

1. *Computer Networks and Internet with Internet Applications*, Douglas E Comer. Pearson, Fourth Edition, 2004

#### Web links and Video Lectures (e-Resources):

- [https://www.udemy.com/course/nwdev\\_from\\_scratch/](https://www.udemy.com/course/nwdev_from_scratch/)

#### Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

#### Course outcome (Course Skill Set)

Sl. No.	Description	Blooms Level
CO1	Study various errors, congestion and multiplexing protocols	L1
CO2	Decide the networking protocols in AP notation	L2
CO3	Compare and contrast on routing, security and compression protocols	L2

## Program Outcome of this course

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

### Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01		x			x							
C02				x			x					
C03			x		x							

<b>NETWORK PROGRAMMING</b>			
Course Code	MSCN215B	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40 hrs	Total Marks	100
Credits	03.	Exam Hours	03
<b>Course Learning objectives:</b>			
CLO 1. Define the key protocols which support the Internet			
CLO 2. Explore working of the TCP/UDP Sockets			
CLO 3. Demonstrate applications using techniques such as multiplexing, forking, multithreading			
CLO 4. Illustrate working of Daemon Processes			
<b>Module-1</b>			
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.			
<b>Teaching-Learning Process</b>	<b>Chalk and Talk method /PPT/ Case study/Web links</b>		
<b>Module-2</b>			
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.			
<b>Teaching-Learning Process</b>	<b>Chalk and Talk method /PPT/ Case study/Web links</b>		
<b>Module-3</b>			
I/O Multiplexing and Socket Options – I/O Modules, select function, str_cli function, batch input and buffering, shutdown function, TCP Echo Server, pselect function, poll function.			
<b>Teaching-Learning Process</b>	<b>Chalk and Talk method /PPT/ Case study/Web links</b>		
<b>Module-4</b>			
Advanced I/O functions – Socket timeouts, recv and send functions, readv, writev, sendmsg and recvmsg. Unix domain protocols - socket address structure, socketpair functions, socket functions Unix domain stream client/server, Unix domain Datagram client/server.			
<b>Teaching-Learning Process</b>	<b>Chalk and Talk method /PPT/ Case study/Web links</b>		
<b>Module-5</b>			
Client/Server Design Alternatives – TCP Client Alternatives, TCP Test Client, TCP Iterative server, TCP Concurrent server, TCP preforked server, no locking around accept, TCP preforked server, file locking around accept, TCP preforked server, thread locking around accept, TCP preforked server, descriptor passing, TCP concurrent server, one thread per client.			
<b>Teaching-Learning Process</b>	<b>Chalk and Talk method /PPT/ Case study/Web links/network Database like <a href="https://crawdad.org/">https://crawdad.org/</a></b>		

### Assessment Details (both CIE and SEE)

The weight age of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

#### Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks** or **one Skill Development Activity of 50 marks** to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

**CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

#### Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

#### Suggested Learning Resources:

##### Text Books

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.

#### Web links and Video Lectures (e-Resources):

- i. <https://archive.nptel.ac.in/courses/106/105/106105183>

#### Skill Development Activities Suggested

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

#### Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Explain the concept of Networking and Transport Layer: TCP, UDP and SCTP.	L2
CO2	Illustrate the working of Sockets	L2
CO3	Demonstrate the Daemon Processes and No blocking I/O (can be attained through assignment or CIE)	L3
CO4	Explain the ioctl operations- socket SAD	L2

Mapping of COS and POs												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01			X			X						
C02		X										X
C03				X						X		
C04								X				X

Program Outcome of this course		
Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

<b>MULTIMEDIA COMMUNICATIONS</b>			
Course Code	MSCN215C	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	3	Exam Hours	03
<b>Course Learning objectives:</b>			
<ul style="list-style-type: none"> <li>• Discuss the multimedia communications systems, application and basic principles.</li> <li>• Able to analyze the multimedia streaming.</li> <li>• Performing and establishing multimedia communication terminals.</li> </ul>			
<b>Module-1</b>			
Introduction, multimedia information representation, multimedia networks, multimedia applications, Application and networking terminology, network QoS and application QoS, Digitization principles, Text, images, audio and video.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
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			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
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.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
Video compression standards: H.261, H.263, MPEG, MPEG 1, MPEG 2, MPEG-4 and Reversible VLCs, Standards for multimedia communications: Reference models, standards relating to interpersonal communications.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-5</b>			
Notion of synchronization, presentation requirements, reference model for synchronization, Introduction to SMIL, Multimedia operating systems, Resource management, process management techniques.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		

### **Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

#### **Continuous Internal Evaluation:**

1. Two Unit Tests each of 25 Marks

2. Two assignments each of 25 Marks or one Skill Development Activity of 50 marks to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be scaled down to 50 marks CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

#### **Semester End Examination:**

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

#### **Suggested Learning Resources:**

##### **Books**

1. *Multimedia Communications*, Fred Halsall, Pearson education, 2001.
2. *Multimedia: Computing, Communications and Applications*, Raif Steinmetz, Klara Nahrstedt, Pearson education, 2002.
3. *Multimedia Communication Systems*, K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, Pearson education, 2004.

#### **Web links and Video Lectures (e-Resources):**

- <https://www.tutorialspoint.com/multimedia/index.htm>
- [https://www.youtube.com/watch?v=NPQW-UwR6vQ&list=PL6wr\\_B29b3UR5weQ80W8aYMkxEAz92IIC](https://www.youtube.com/watch?v=NPQW-UwR6vQ&list=PL6wr_B29b3UR5weQ80W8aYMkxEAz92IIC) (Video Lectures)

#### **Skill Development Activities Suggested**

The students with the help of the course teacher can take up relevant technical – activities which will enhance their skill.



**Course outcome (Course Skill Set)**

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

Sl. No.	Description	Blooms Lev
C01	Deploy the right multimedia communication models.	L3
C02	Apply QoS to multimedia network applications with efficient routing techniques.	L3
C03	Communicate clearly and concisely, visually, verbally and in writing, using techniques appropriate for the intended audience.	L2
C04	Identify the basic components of a multimedia project.	L2

**Mapping of COS and POs**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>C01</b>					x			x				
<b>C02</b>	x					x						
<b>C03</b>						x						x
<b>C04</b>		x		x								

**Program Outcome of this course**

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8

9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

## NETWORK MANAGEMENT

Course Code	MSCN215D	CIE Marks	50
Teaching Hours/Week (L:P:S)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
<b>Module-1</b>			
<p><b>Introduction:</b> 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.</p>			
<b>Module 2</b>			
<p>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.</p>			
<b>Module 3</b>			
<p>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.</p>			
<b>Module 4</b>			
<p>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 Channelling 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</p>			
<b>Module-5</b>			
<p>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.</p>			
<b>Course outcomes:</b>			
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.

<b>Textbook/ Textbooks</b>				
<b>SI No</b>	<b>Title of the book</b>	<b>Name of the Author/s</b>	<b>Publisher Name</b>	<b>Edition and year</b>
1	Network Management- Principles and Practice	Mani Subramanian	Pearson Education	2nd, 2010
<b>Reference Books</b>				
1	Network management Concepts and Practices: a Hands-On Approach	J. Richard Burke	PHI	2008

### **Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

#### **Continuous Internal Evaluation:**

1. Two Unit Tests each of 25 Marks
2. Two assignments each of 25 Marks or one Skill Development Activity of 50 marks to attain the COs and POs

The sum of two tests, two assignments/skill Development Activities, will be scaled down to 50 marks. CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

#### **Semester End Examination:**

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

#### **Suggested Learning Resources:**

##### **Books**

1. *Cryptography and Network Security Principles And Practice* William Stallings, Pearson Education, Fourth Edition
2. *A Course in Number Theory and Cryptology*, Neal Koblitz, Springer, 1987
3. *Cryptography and Network Security*, Behrouz A Forouzan, Debdeep Mukhopadhyay, McGrawHill, 3rd Edition, 2015

#### **Web links and Video Lectures (e-Resources):**

<https://www.youtube.com/watch?v=rAZmWPormM>

#### **Skill Development Activities Suggested**

The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill. The prepared report shall be evaluated for CIE marks.

**Course outcome (Course Skill Set)**

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

Sl. No.	Description	Blooms Level
C01	Understand OSI security architecture and classical encryption techniques.	L1
C02	Understand various block cipher and stream cipher models.	L2
C03	Describe the principles of public key cryptosystems, hash functions and digital signature.	L2
C04	Compare various Cryptographic Techniques	L2

**Mapping of COS and POs**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
<b>C01</b>			<b>X</b>				<b>X</b>			
<b>C02</b>	<b>X</b>							<b>X</b>		<b>X</b>
<b>C03</b>					<b>X</b>				<b>X</b>	
<b>C04</b>										

**Program Outcome of this course**

Sl. No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	Po1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	PO5
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10

11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	PO11
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

### MINI PROJECT WITH SEMINAR

Course Code	MSCN206	CIE Marks	50
Number of contact Hours/Week	3	SEE Marks	50
Credits	3	Exam Hours/Batch	03

**Course objectives:**

- To support independent learning and innovative attitude.
- To guide to select and utilize adequate information from varied resources upholding ethics.
- To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- To develop interactive, communication, organization, time management, and presentation skills.
- To impart flexibility and adaptability.
- To inspire independent and team working.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meeting deadlines.
- To instill responsibilities to oneself and others.
- To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.

**Mini-Project:** Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism.

**Course outcomes:**

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

- Present the mini-project and be able to defend it.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
- Habituated to critical thinking and use problem solving skills.
- Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
- Work in a team to achieve common goal.
- Learn on their own, reflect on their learning and take appropriate actions to improve it.

**CIE procedure for Mini - Project:**

The CIE marks awarded for Mini - Project, shall be based on the evaluation of Mini - Project Report, Project Presentation skill and Question and Answer session in the ratio 50:25:25. The marks awarded for Mini - Project report shall be the same for all the batch mates.

**Semester End Examination**

SEE marks for the mini-project shall be awarded based on the evaluation of Mini-Project Report, Presentation skill and Question and Answer session in the ratio 50:25:25 by the examiners appointed by the University.



<b>Computer Networks and IoT Laboratory</b>			
Course Code	MSCNL207	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:2:0	SEE Marks	50
Credits	02	Exam Hours	03
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>• To interpret the working principle of various communication protocols.</li> <li>• To analyze the various routing algorithms.</li> <li>• To know the concept of data transfer between nodes.</li> <li>• To interpret the IoT using Arduino programming.</li> <li>• To explain the interfacing of data, I/O devices with Arduino UNO.</li> <li>• To describe the digital protection schemes in power system relays.</li> </ul>			
<b>Sl.NO</b>	<b>Experiments</b>		
PART A: Computer Network Laboratory			
Implement the following using C/C++ or equivalent with LINUX/Windows environment:			
1	<b>Write a program to archive Traffic management at Flow level by implementing Closed Loop Control technique. (Leaky Bucket Algorithm)</b>		
2	Write a program to implement dynamic routing strategy in finding optimal path for data transmission. (Bellman ford algorithm).		
3	Write a program to implement Link State Routing (Dijkstra Algorithm).		
4	Write a program for providing security for transfer of data in the network. (RSA Algorithm)		
5	Write a program for encrypting 64 bit playing text using DES algorithm.		
6	Apply the RSA algorithm on a text file to produce cipher text file.		
7	Develop a mechanism to setup a security channel using Diffie-Hellman Key Exchange between client and server		
8	Implement secure hash algorithm for Data Integrity. Implement MD5 and SHA-1 algorithm, which accepts a string input, and produce a fixed size number - 128 bits for MD5; 160 bits for SHA-1, this number is a hash of the input. Show that a small change in the input results in a substantial change in the output.		
<b>Demonstration Experiments ( For CIE) if any</b>			
9	Simulate a 3 node point to point network with duplex links between them. Set the Queue size and vary the bandwidth and find the number of packets dropped.		
10	Simulate a four-node point-to-point network, and connect the links as follows: n0->n2, n1>n2 and n2->n3. Apply TCP agent changing the parameters and determine the number of packets sent/received by TCP/UDP		
PART B – IOT Laboratory			
1	Transmit a string using UART		
2	Point-to-Point communication of two Motes over the radio frequency.		
3	Multi-point to single point communication of Motes over the radio frequency.LAN (Subnetting).		

**Course outcomes (Course Skill Set):**

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

- Apply key Internet applications and their protocols, and ability to develop their own applications (e.g. Client Server applications, Web Services) using the sockets API.
- Design and evaluate application layer protocol
- 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.

**Assessment Details (both CIE and SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 40% of maximum marks in the semester-end examination (SEE). In total of CIE and SEE student has to secure 50% maximum marks of the course.

**Continuous Internal Evaluation (CIE):**

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8<sup>th</sup> week of the semester and the second test shall be conducted after the 14<sup>th</sup> week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of **scaled-down** marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

**Semester End Evaluation (SEE):**

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University.

All laboratory experiments are to be included for practical examination.

(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.

Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 10% Marks allotted to the procedure part to be made zero.

The duration of SEE is 03 hours

## SKILL ENHANCEMENT FOR RESEARCH EXCELLENCE-1

Course Code	MSCS258	CIE Marks	50
Number of contact Hours/Week	2	SEE Marks	50
Credits	01	Exam Hours/Batch	03

The M.Tech Research Skills Development program equips students with essential skills for successful research and publication, including understanding research fundamentals, conducting literature reviews, selecting appropriate methodologies, writing proposals and papers, analyzing data, presenting findings, adhering to ethical standards, and engaging in networking and collaboration, culminating in the effective publication of only 1 research article to Scopus-indexed conferences.

### Course objectives:

- To produce high-quality research papers that meet the standards of international conferences or peer-reviewed journals.
- To effectively identify suitable journals for publication based on the scope and impact of research findings.
- To demonstrate proficiency in writing and structuring research papers according to academic conventions.
- To engage in the peer review process, providing and receiving constructive feedback to enhance research quality.
- To develop skills for presenting research at conferences, including crafting effective abstracts and posters.
- To cultivate a strong understanding of ethical considerations in research and publication practices.
- To utilize citation management tools to organize references and ensure proper attribution in publications.
- To enhance collaboration skills for co-authoring papers and working within research teams.
- To stay informed about current trends and advancements in the field to ensure relevance in publications.
- To refine the ability to respond to reviewer comments and revise manuscripts effectively.
- To understand the importance of open access and alternative publication models in disseminating research.
- To build a professional network that supports research collaborations and publication opportunities.

**Guidelines for Research paper preparation:** Each student in a group of two members shall actively participate in carrying out the research work jointly, in constant consultation with the internal guide, mentors or co-guide, and external guide. They must prepare the project report as per the prescribed norms while ensuring plagiarism is avoided. A research group can have a maximum of two members.

### 1. Understanding Research Fundamentals

- **Definition of Research:** Understand what constitutes research and its significance in technology and engineering.
- **Types of Research:**

**Basic Research:** Focused on gaining comprehensive knowledge without immediate applications.

**Applied Research:** Aimed at solving specific problems.

#### Literature Review

- **Conducting a Literature Survey:**  
Identify relevant academic papers, journals, and conference proceedings.  
Summarize key findings and methodologies from existing literature.
- **Critical Analysis:**  
Evaluate the strengths and weaknesses of existing research.  
Identify gaps in the literature that your research can address.

### 2. Research Methodology

- **Selecting a Research Topic:**  
Choose a topic that aligns with your interests and current trends in technology.
- **Research Design:**  
Decide on qualitative, quantitative, or mixed methods based on your research objectives.
- **Data Collection Techniques:**  
Surveys, interviews, experiments, and simulations.

### 3. Writing Research Proposals

- **Structure of a Proposal:**  
Introduction, Literature Review, Methodology, Expected Outcomes, and References.
- **Proposal Presentation:**  
Practice presenting your proposal to peers and faculty for feedback.

### 4. Data Analysis

- **Statistical Tools:**  
Familiarize yourself with tools like MATLAB, R, or Python for data analysis.
- **Interpreting Results:**  
Learn to draw meaningful conclusions from your data and relate them back to your research questions.

### 5. Writing Research Papers

- **Structure of a Research Paper:**

Abstract, Introduction, Methodology, Results, Discussion, Conclusion, and References.

- **Academic Writing Skills:**  
Focus on clarity, coherence, and proper citation of sources.
- **Peer Review Process:**  
Understand the importance of peer review and how to respond to reviewers' comments.

#### 6. Presentation Skills

- **Effective Communication:**  
Develop skills to present your research findings clearly and confidently.
- **Use of Visual Aids:**  
Incorporate slides, charts, and graphs to enhance your presentations.

#### 7. Ethical Considerations in Research

- **Understanding Ethics:**  
Familiarize yourself with ethical guidelines related to research involving human subjects, data privacy, and plagiarism.
- **Responsible Conduct of Research:**  
Promote integrity and accountability in your research practices.

### Submitting Manuscripts to Scopus-Indexed Conferences or Web of Science or Proceedings /Book Chapters

#### 1. Identify Relevant Conferences

- **Research Scopus-Indexed Conferences:**  
Use platforms like Conference Alerts, IEEE Xplore, or the Scopus website to find conferences in your field.
- **Check Conference Indexing:**  
Ensure that the conference is indexed in Scopus by checking its official website or the Scopus database.

#### 2. Prepare Your Manuscript

- **Follow Conference Guidelines:**  
Each conference has specific formatting and submission guidelines. Adhere to these requirements.
- **Structure of the Manuscript:**  
Title, Abstract, Introduction, Methodology, Results, Discussion, Conclusion, and References.
- **Language and Clarity:**  
Use clear and concise language. Consider having your manuscript proofread by peers or professionals.
- **Submission of manuscript, Registration and Presentation finally Publication**

### Course outcomes:

- At the end of the course the student will be able to:
- Produce High-Quality Research Papers: Create research papers that meet international conference and peer-reviewed journal standards.
- Identify Suitable Journals: Effectively select appropriate journals for publication based on research scope and impact.
- Proficiency in Writing: Demonstrate skill in writing and structuring research papers according to academic conventions.
- Engage in Peer Review: Actively participate in the peer review process by providing and receiving constructive feedback.
- Develop Presentation Skills: Acquire skills for presenting research at conferences, including crafting effective abstracts and posters.
- Understand Ethical Considerations: Cultivate a strong understanding of ethical issues in research and publication practices.
- Utilize Citation Management Tools: Use citation management tools to organize references and ensure proper attribution.
- Respond to Reviewer Comments: Refine the ability to address reviewer comments and revise manuscripts effectively.

The assessment for **Skill Enhancement for Research Excellence** will be divided into **Continuous Internal Evaluation (CIE) and Semester End Examination (SEE)**, each carrying 50 marks.

#### Continuous Internal Evaluation (CIE) – 50 Marks

CIE shall be conducted **weekly** and will be assessed based on:

- **Base Papers Referred & Review** – 10 Marks
- **Presentations on Proposed Concepts** – 15 Marks
- **Preparation of Conference Papers (Preferably Scopus Indexed or Reputed Conferences)** – 25 Marks

**Semester End Examination (SEE) – 50 Marks**

- The **SEE examiner may be appointed from the same college** for evaluation.
- The candidate must **present their research work** before the examiner.
- **Mandatory requirement:** The candidate must have **submitted a paper to a conference or accepted or presented** at a reputed conference.
- Marks will be awarded based on:
  - **Research Presentation Quality** – 25 Marks
  - **Clarity of Concept & Methodology** – 15 Marks
  - **Conference Submission & Acceptance/Presentation** – 10 Marks