

<b>Advances in Operating Systems</b>			
Course Code	MSCS201	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 :

<b>Sl.No.</b>	<b>Description</b>	<b>BloomsLevel</b>
C01	Analyze the characteristics of operating systems for multiprocessor and multicomputer architectures.	L2
C02	Understand and address the challenges related to designing operating systems and their implications.	L3
C03	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:**

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

<b>Advances in Computer Networks</b>			
Course Code	MSCS202	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:1:0	SEE Marks	50
Total Hours of Pedagogy	50	Total Marks	100
Credits	4	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>			
Foundation: Building a Network, Requirements, Perspectives, Scalable Connectivity, Cost-Effective Resource sharing, Support for Common Services, Manageability, Protocol layering, Performance, Bandwidth and Latency, Delay X Bandwidth Product, Perspectives on Connecting, Classes of Links, Reliable Transmission, Stop-and-Wait, Sliding Window, Concurrent Logical Channels.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
Internetworking I: Switching and Bridging, Datagram's, Virtual Circuit Switching, Source Routing, Bridges and LAN Switches, Basic Internetworking (IP), What is an Internetwork?, Service Model, Global Addresses, Datagram Forwarding in IP, sub netting and classless Addressing, Address Translation (ARP), Host Configuration (DHCP), Error Reporting (ICMP), Virtual Networks and Tunnels.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
Internetworking- II: Network as a Graph, Distance Vector (RIP), Link State (OSPF), Metrics, The Global Internet, Routing Areas, Routing among Autonomous systems (BGP), IP Version 6 (IPv6), Mobility and Mobile IP			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
End-to-End Protocols: Simple Demultiplexer (UDP), Reliable Byte Stream(TCP), End-to-End Issues, Segment Format, Connecting Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, Record Boundaries, TCP Extensions, Queuing Disciplines, FIFO, Fair Queuing, TCP Congestion Control, Additive Increase/ Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		

<b>Module-5</b>	
Congestion Control and Resource Allocation Congestion-Avoidance Mechanisms, DEC bit, Random Early Detection (RED), Source-Based Congestion Avoidance. The Domain Name System (DNS), Electronic Mail (SMTP,POP,IMAP,MIME), World Wide Web (HTTP), Network Management (SNMP)	
<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:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- 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 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

#### Suggested Learning Resources:

##### Text Books:

- Computer Networks: A System Approach, Larry Peterson and Bruce S Davis, Elsevier, 5th Edition 2014
- Internetworking with TCP/IP, Principles, Protocols and Architecture, Douglas E Comer, PHI, 6th Edition 2014.

##### Reference Books:

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

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

### Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
C01	Identify the vulnerabilities in any computing system and hence be able to design a security solution.	L2
C02	Identify the security issues in the network and resolve it.	L2
C03	Analyze security mechanisms using rigorous approaches, including theoretical.	L2
C04	Apply various protocols for network security to protect against the threats in the networks	L3

<b>Program Outcome of this course</b>		
<b>Sl. No.</b>	<b>Description</b>	<b>POs</b>
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>Network Programming</b>			
Course Code	MSCS203	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>• Define the key protocols which support the Internet</li> <li>• Explore working of the TCP/UDP Sockets</li> <li>• Demonstrate applications using techniques such as multiplexing, forking, multithreading</li> <li>• Illustrate working of Daemon Processes</li> </ul>			
<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>	Chalk and Talk/ PPT		
<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>	Chalk and Talk/ PPT		
<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>	Chalk and Talk/ PPT		
<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>	Chalk and Talk/ PPT		
<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>	Chalk and Talk/ 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**

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:**

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- 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 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

### **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):

- <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.	L3
CO2	Illustrate the working of Sockets	L1
CO3	Demonstrate the Daemon Processes and No blocking I/O	L2
CO4	Explain the ioctl operations- socket SAD	L1

**Mapping of COS and POs**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			X			X				X		
CO2							X					x
CO3			X			X						
CO4	X	X			X							

<b>Blockchain Technology</b>			
Course Code	MSCS214A	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 the strong technical knowledge of Blockchain technologies.</li> <li>• Analyzing the blockchain decentralization and cryptography concepts.</li> <li>• 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)**

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:**

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- 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 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

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

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

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

##### **Reference Books:**

- *Blockchain Basics: A Non-Technical Introduction in 25 Steps*, Daniel Drescher, Apress, First Edition, 2017
- *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)**

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

Sl. No.	Description	Blooms Level
C01	Explore the emerging abstract models for Blockchain Technology and to familiarise with the functional/operational concepts.	L1
C02	Analyze the various consensus mechanisms, applications, research challenges and future directions.	L3
C03	Practical implementation of Blockchain operations and solutions using Ethereum	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.	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**

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

<b>Information and Network Security</b>			
Course Code	MSCS214B	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 the basics of Cryptography and Network Security.</li> <li>• Secure a message over insecure channel by various means.</li> <li>• Maintain the Confidentiality, Integrity, Reliability and Availability of a data.</li> </ul>			
<b>Module-1</b>			
<p>Classical Encryption Techniques Symmetric Cipher Model, Cryptography, Cryptanalysis and BruteForce Attack, Substitution Techniques, Caesar Cipher, Mono-alphabetic Cipher, Playfair Cipher, Hill Cipher, Poly alphabetic Cipher, One Time Pad. Block Ciphers and the data encryption standard: Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the Feistel Cipher structure, the Feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm</p>			
<b>Teaching-Learning Process</b>	Chalk and Talk/ PPT		
<b>Module-2</b>			
<p>Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. Public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. Other Public-Key Cryptosystems: Diffie-Hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, abelian groups, elliptic curves over real</p>			
<b>Teaching-Learning Process</b>	Chalk and Talk/ PPT		
<b>Module-3</b>			
<p>Key Management and Distribution: Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates, X-509 certificates. Certificates, X-509 version 3, public key infrastructure. User Authentication: Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one way Authentication, Kerberos, Motivation , Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption, Mutual Authentication, one wayAuthentication, federated identity management, identity management, identity federation, personal identity verification.</p>			
<b>Teaching-Learning Process</b>	Chalk and Talk/ PPT		



<b>Module-4</b>	
<p>Wireless network security: Wireless security, Wireless network threats, Wireless network measures, mobile device security, security threats, mobile device security strategy, IEEE 802.11 Wireless LAN overview, the Wi-Fi alliance, IEEE 802 protocol architecture. Security, IEEE 802.11i services, IEEE 802.11i phases of operation, discovery phase, Authentication phase, key management phase, protected data transfer phase, the IEEE 802.11i pseudorandom function. Web Security Considerations: Web Security Threats, Web Traffic Security Approaches. Secure Sockets Layer: SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, and shake Protocol, Cryptographic Computations. Transport Layer Security: Version Number, Message Authentication Code, Pseudorandom Functions, Alert Codes, Cipher Suites, Client Certificate Types, Certificate Verify and Finished Messages, Cryptographic Computations, and Padding. HTTPS Connection Initiation, Connection Closure. Secure Shell(SSH)</p> <p>Transport Layer Protocol, User Authentication Protocol, Connection Protocol</p>	
<b>Teaching-Learning Process</b>	Chalk and Talk/ PPT
<b>Module-5</b>	
<p>Electronic Mail Security: Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate processing, enhanced security services, Domain keys identified mail, internet mail architecture, E-Mail threats, DKIM strategy, DKIM functional flow. IP Security: IP Security overview, applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating Security payload, ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes, combining security associations, authentication plus confidentiality, basic combinations of security associations, internet key exchange, key determinations protocol, header and payload formats, cryptographic suits.</p>	
<b>Teaching Learning Process</b>	Chalk and Talk/ PPT
<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 <b>25 Marks</b></li> <li>2. Two assignments each of <b>25 Marks</b> or <b>one Skill Development Activity of 50 marks</b></li> </ol> <p>The sum of two tests, two assignments/skill Development Activities, will be scaled down to 50 marks</p> <p><b>CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.</b></p> <p><b>Semester End Examination:</b></p> <ul style="list-style-type: none"> <li>• The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.</li> <li>• The question paper will have ten full questions carrying equal marks.</li> <li>• Each full question is for 20 marks. There will be two full questions (with a maximum of four sub- questions)</li> </ul>	

from each module.

- 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

**Suggested Learning Resources:**

Books

1. *Cryptography and Network Security*, William Stallings, Pearson, 6<sup>th</sup> Edition
2. *Cryptography and Information Security*, V K Pachghare, PHI, 2<sup>nd</sup> Edition

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

1. <https://www.coursera.org/specializations/computer-network-security>

**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	Identify the vulnerabilities in any computing system and hence be able to design a security solution.	L2
C02	Identify the security issues in the network and resolve it.	L2
C03	Analyze security mechanisms using rigorous approaches, including theoretical.	L2
C04	Apply various protocols for network security to protect against the threats in the networks	L3

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
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>Deep Learning</b>			
Course Code	MSCS214C	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>• Discuss the context of neural networks and deep learning</li> <li>• Have a working knowledge of neural networks and deep learning</li> <li>• Explore the parameters for neural networks</li> </ul>			
<b>Module-1</b>			
Machine Learning Basics: Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimator, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, building a Machine Learning Algorithm, Challenges Motivating Deep Learning.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
Deep Feedforward Networks: Gradient-Based Learning, Hidden Units, Architecture Design, BackPropagation. Regularization: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, SemiSupervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging, Dropout.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
Optimization for Training Deep Models: How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms. Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates. Convolutional Networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
Sequence Modelling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks. Long short-term memory			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-5</b>			
Practical Methodology: Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyperparameters, Debugging Strategies, Example: Multi-Digit Number Recognition. Applications: Vision, NLP, Speech.			

<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content
<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> <p>1. • Two Unit Tests each of <b>25 Marks</b></p> <p>Two assignments each of <b>25 Marks</b> or <b>one Skill Development Activity of 50 marks</b> to attain the COs and POs</p> <p>The sum of two tests, two assignments/skill Development Activities, will be scaled down to 50 marks</p> <p>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> <ul style="list-style-type: none"> <li>• The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.</li> <li>• The question paper will have ten full questions carrying equal marks.</li> <li>• 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>• Each full question will have a sub-question covering all the topics under a module.</li> <li>• The students will have to answer five full questions, selecting one full question from each module</li> </ul>	
<p><b>Suggested Learning Resources:</b></p> <p><b>Books:</b></p> <ul style="list-style-type: none"> <li>• Deep Learning, Ian Good fellow and YoshuaBengio, MIT Press <a href="https://www.deeplearningbook.org/">https://www.deeplearningbook.org/</a> 2016.</li> <li>• Neural Networks:Asystematic Introduction, Raúl Rojas, 1996.</li> <li>• Pattern Recognition and machine Learning, Chirstopher Bishop, 2007.</li> </ul>	
<p><b>Web links and Video Lectures (e-Resources):</b></p> <ul style="list-style-type: none"> <li>• <a href="https://www.simplilearn.com/tutorials/deep-learning-tutorial">https://www.simplilearn.com/tutorials/deep-learning-tutorial</a></li> <li>• <a href="https://www.kaggle.com/learn/intro-to-deep-learning">https://www.kaggle.com/learn/intro-to-deep-learning</a></li> <li>• <a href="https://www.javatpoint.com/deep-learning">https://www.javatpoint.com/deep-learning</a></li> </ul>	
<p><b>Skill Development Activities Suggested</b></p> <p>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.</p>	

**Course outcome (Course Skill Set)**

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

Sl. No.	Description	Blooms Level
C01	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.	L2
C02	Implement deep learning algorithms and solve real-world problems.	L3
C03	Execute performance metrics of Deep Learning Techniques.	L3
C04	Compare modeling aspects of various neural network architectures.	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**

	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>							
<b>C04</b>		<b>x</b>					<b>x</b>					

<b>Decision Support Systems</b>			
Course Code	MSCS214D	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 the relationship between business information needs and decision making</li> <li>Select appropriate modeling techniques</li> <li>Able to Analyze, design and implement a DSS</li> </ul>			
<b>Module-1</b>			
<p>Introduction to decision support systems: DSS Defined, History of decision support systems, Ingredients of a DSS, Data and model management, DSS Knowledge base, User interfaces, The DSS user, Categories and classes of DSSs, Chapter Summary. Decisions and decision makers Decision makers: who are they, Decision styles, Decision effectiveness, How can a DSS help?, A Typology of decisions, Decision theory and simon's model of problem solving, Bounded decision making, The process of choice, Cognitive processes, Biases and heuristics in decision making</p>			
<b>Teaching-Learning Process</b>	Chalk and Talk PPT		
<b>Module-2</b>			
<p>Decisions in the organization: Understanding the organization, Organizational culture. Modelling decision processes: Defining the problem and its structures, Decision models, Types of probability, Techniques for forecasting probabilities, Calibration and sensitivity</p>			
<b>Teaching-Learning Process</b>	Chalk and Talk PPT		
<b>Module-3</b>			
<p>Group decision support and groupware technologies: Group Decision making, the problem with groups, MDM support technologies, Managing MDM activities, the virtual workspace, chapter summary. Executive information systems: What exactly is an EIS, Some EIS history, Why area top executives so different?, EIS components, Making the EIS work, The future of executive decision making and the EIS.</p>			
<b>Teaching-Learning Process</b>	Chalk and Talk PPT		
<b>Module-4</b>			
<p>Designing and building decision support systems: Strategies for DSS analysis and design, The DSS developer, DSS user interface issues, chapter summary. Implementing and integrating decision support systems: DSS implementation, System evaluation, The importance of integration, chapter summary.</p>			
<b>Teaching-Learning Process</b>	Chalk and Talk PPT		



<b>Module-5</b>	
Creative decision making and problem solving What is creativity?, Creativity defined, The occurrence of creativity, Creative problem solving techniques, Creativity and the role of technology, chapter summary.	
<b>Teaching-Learning Process</b>	Chalk and Talk PPT
<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>Two Unit Tests each of <b>25 Marks</b></li> <li>Two assignments each of <b>25 Marks</b> or <b>one Skill Development Activity of 50 marks</b> 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</p> <p><b>CIE methods /question paper is designed to attain the different levels of Bloom’s taxonomy as per the outcome defined for the course.</b></p> <p><b>Semester End Examination:</b></p> <ol style="list-style-type: none"> <li>The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.</li> <li>The question paper will have ten full questions carrying equal marks.</li> <li>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>Each full question will have a sub-question covering all the topics under a module.</li> <li>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>Books</b></p> <ul style="list-style-type: none"> <li>Decision support system, George M.Marakas, PHI, 2011.</li> <li>Decision Support Systems, Marakas, 2nd Edition, Pearson India, 2015.</li> </ul>	
<p><b>Web links and Video Lectures (e-Resources):</b></p> <ul style="list-style-type: none"> <li><a href="https://www.coursera.org/lecture/business-intelligence-tools/decision-support-systems-videolecture-E8P9x">https://www.coursera.org/lecture/business-intelligence-tools/decision-support-systems-videolecture-E8P9x</a></li> </ul>	
<p><b>Skill Development Activities Suggested</b></p> <p>The students with the help of the course teacher can take up relevant technical – activities which will enhance their skill.</p>	
<p><b>Course outcome (Course Skill Set)</b></p>	

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

Sl. No.	Description	Blooms Level
C01	Appraise issues related to the development of DSS	L1
C02	Select appropriate modeling techniques	L2
C03	Analyze and implement a DSS	L3
C04	Demonstrate qualitative and quantitative skills and critical thinking to proficiencies in the application of theory surrounding the DSS.	L3

**Mapping of COS and POs**

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P01 0	P01 1	P01 2
<b>C01</b>		x									x	
<b>C02</b>			x		x							x
<b>C03</b>				x	x							
<b>C04</b>		x	x									

<b>Program Outcome of this course</b>		
<b>Sl. No.</b>	<b>Description</b>	<b>POs</b>
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>Computer Vision</b>			
Course Code	MSCS215A	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>• Explore the fundamentals of image formation.</li> <li>• Discuss the major ideas, methods, and techniques of computer vision and pattern recognition.</li> <li>• Able to implement algorithms and techniques to analyze and interpret the visible world around us.</li> </ul>			
<b>Module-1</b>			
CAMERAS: Pinhole Cameras, Radiometry – Measuring Light: Light in Space, Light Surfaces, Important Special Cases, Sources, Shadows, And Shading: Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models, Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.			
<b>Teaching-Learning Process</b>	Chalk and talk PPT		
<b>Module-2</b>			
Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, Edge Detection: Noise, Estimating Derivatives, Detecting Edges, Texture: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.			
<b>Teaching-Learning Process</b>	Chalk and talk PPT		
<b>Module-3</b>			
The Geometry of Multiple Views: Two Views, Stereopsis: Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras, Segmentation by Clustering: What Is Segmentation?, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering.			
<b>Teaching-Learning Process</b>	Chalk and talk PPT		
<b>Module-4</b>			
Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness, Segmentation and Fitting Using Probabilistic Methods: Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice, Tracking With Linear Dynamic Models: Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples.			

<b>Teaching-Learning Process</b>	Chalk and talk PPT
<b>Module-5</b>	
<p>Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations, Geometric Camera Calibration: Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization, Model- Based Vision: Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.</p>	
<b>Teaching-Learning Process</b>	Chalk and talk PPT
<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 <b>25 Marks</b></li> <li>2. Two assignments each of <b>25 Marks</b> or <b>one Skill Development Activity of 50 marks</b> 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</p> <p><b>CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.</b></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>Books</b></p> <ol style="list-style-type: none"> <li>1. Computer Vision – A Modern Approach, David A. Forsyth and Jean Ponce, PHI Learning, 2009.</li> <li>2. Computer and Machine Vision – Theory, Algorithms and Practicalities, E. R. Davies, Elsevier 4<sup>th</sup> Edition, 2013.</li> </ol>	
<p><b>Web links and Video Lectures (e-Resources):</b></p>	
<ul style="list-style-type: none"> <li>• <a href="https://www.digimat.in/nptel/courses/video/108103174/L19.html">https://www.digimat.in/nptel/courses/video/108103174/L19.html</a></li> </ul>	

**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 :

<b>Sl. No.</b>	<b>Description</b>	<b>Blooms Level</b>
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

<b>Program Outcome of this course</b>		
<b>Sl. No.</b>	<b>Description</b>	<b>POs</b>
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>P01</b>	<b>P02</b>	<b>P03</b>	<b>P04</b>	<b>P05</b>	<b>P06</b>	<b>P07</b>	<b>P08</b>	<b>P09</b>	<b>P010</b>	<b>P011</b>	<b>P012</b>
<b>C01</b>		x		x						x		
<b>C02</b>			x									
<b>C03</b>	x				x		x		x			
<b>C04</b>		x								x		



<b>Wireless Network and Mobile Computing</b>			
Course Code	MSCS215B	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>• Define the Mobile computing technologies, GPRS Network Architecture.</li> <li>• Interpret Spread Spectrum technology</li> <li>• Define Mobile OS.</li> </ul> Build Wireless Internet Applications			
<b>Module-1</b>			
Mobile Computing Architecture: Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing. Emerging Technologies: Wireless broadband (WiMAX), Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6. Wireless Networks : Global Systems for Mobile Communication (GSM): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Short Service Messages (SMS): Introduction to SMS, SMS Architecture, SMMT, SMMO, SMS as Information bearer, applications, GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-2</b>			
Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-3</b>			
Mobile OS and Computing Environment: Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux, Proprietary OS Client Development: The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-4</b>			
Building Wireless Internet Applications: Thin client overview: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content		
<b>Module-5</b>			

	J2ME: Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life cycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content:
<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>3. Two Unit Tests each of <b>25 Marks</b></li> <li>4. Two assignments each of <b>25 Marks</b> or <b>one Skill Development Activity of 50 marks</b> 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> <ul style="list-style-type: none"> <li>• The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.</li> <li>• The question paper will have ten full questions carrying equal marks.</li> <li>• Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.</li> </ul> <p>Each full question will have a sub-question covering all the topics under a module.</p> <ul style="list-style-type: none"> <li>• The students will have to answer five full questions, selecting one full question from each module</li> </ul>	
<p><b>Suggested Learning Resources:</b></p> <p><b>Text Books:</b></p> <ul style="list-style-type: none"> <li>• Mobile Computing, Technology, Applications and Service Creation , Ashok Talukder, Roopa Yavagal, Hasan Ahmed, Tata McGraw Hill, 2nd Edition, 2010</li> <li>• Mobile and Wireless Design Essentials, Martyn Mallik, Wiley India,2003</li> </ul> <p><b>Reference Books:</b></p> <ul style="list-style-type: none"> <li>• Mobile Computing, Raj kamal, Oxford University Press,2007</li> <li>• Wireless Communications and Networks, 3G and Beyond, ItiSahaMisra, Tata McGraw Hill,2009</li> </ul>	
<p><b>Web links and Video Lectures (e-Resources):</b></p>	
<ul style="list-style-type: none"> <li>• <a href="https://www.digimat.in/nptel/courses/video/106106147/L01.html">https://www.digimat.in/nptel/courses/video/106106147/L01.html</a></li> </ul>	
<p><b>Skill Development Activities Suggested</b></p> <ul style="list-style-type: none"> <li>• The students with the help of the course teacher can take up relevant technical –activities which will enhance their skill.</li> </ul>	

**Course outcome (Course Skill Set)**

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

Sl. No.	Description	Blooms Level
CO1	Explain state of art techniques in wireless communication	L2
CO2	Discover CDMA, GSM. Mobile IP, WiMAX	L2
CO3	Demonstrate program for CLDC, MIDP let model and security concerns	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**

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
C01		x		x								x
C02		x	X									x
C03				x	x							

<b>Software Project Planning and Management</b>			
Course Code	MSCS215C	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>Enhance software delivery predictability and includes requirements gathering, planning and designing the product.</li> <li>Planning a framework enables the manager to make reasonable estimates of resources, cost, and schedule.</li> </ul>			
<b>Module-1</b>			
<p>Metrics: Introduction, The Metrics Roadmap, A Typical Metrics Strategy, What Should you Measure?, Set Targets and track Them, Understanding and Trying to minimize variability, Act on data, People and Organizational issues in Metrics Programs, the processes and activities of software configuration management, configuration status accounting, configuration audit, software configuration management in geographically distributed teams, Metrics in software configuration management, software configuration management tools and automation.</p>			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content: <a href="https://youtu.be/iANBytZ26MI">https://youtu.be/iANBytZ26MI</a>		
<b>Module-2</b>			
<p>Risk Management: Introduction, What is risk management and why is it important?, Risk management cycle, Risk identification: common tools and techniques, Risk Monitoring, Risk Mitigation, Risks and Mitigation in the context of global project teams, some practical techniques risk management, Metrics in risk management. Project Planning and Tracking: Components of Project Planning and Tracking, The "What " Part of a Project Plan, The "What Cost " Part of a Project Plan, The "When " Part of Project Planning, The "How " Part of a Project Planning: Tailoring of Organizational Processes For the Project, The " By Whom " Part of the Project Management Plan : Assigning Resources, Putting it all together : The Software Management Plan, Activities Specific to Project Tracking, Interfaces to the Process Database.</p>			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content: <a href="https://youtu.be/KqaPMCMHH4g">https://youtu.be/KqaPMCMHH4g</a>		
<b>Module-3</b>			
<p>Software Requirements gathering: Inputs and start criteria for requirements gathering, Dimensions of requirements gathering, Steps to be followed during requirements gathering, outputs and quality records from the requirements phase, Metrics for requirements phase. Estimation: What is Estimation? When and why is Estimation done?, the three phases of Estimation, Estimation methodology, formal models for size Estimation, Metrics for the Estimation processes. Design and Development Phases: Some differences in our chosen approach, salient features of design, evolving an architecture/ blueprint, design for reusability, technology choices/ constraints, design to standards, design for testability, design for diagnose ability, design for install ability, interoperability design, challenges during design and development phases, metrics for design and development phases.</p>			
<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content: <a href="https://youtu.be/b-lvmXo00bU">https://youtu.be/b-lvmXo00bU</a>		
<b>Module-4</b>			

Project management in the testing phase: Introduction, What is testing?.Project management in the Maintenance Phase: Introduction, Activities during Maintenance Phase, management issues during Maintenance Phase, Configuration management during Maintenance Phase, skill sets for people in the maintenance phase, estimating size, effort, and people resources for the maintenance phase, advantages of using geographically distributed teams for the maintenance phase, metrics for the maintenance phase.

<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content: <a href="https://youtu.be/SqvAaB3vK8U">https://youtu.be/SqvAaB3vK8U</a>
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**Module-5**

Globalization issues in project management: Evolution of globalization, challenges in building global teams, Models for the execution of global projects, some effective management techniques for managing global teams. Impact of the internet on project management: Introduction, the effect of internet on project management, managing projects for the internet, Effect on the project management activities. People focused process models: Growing emphasis on people centric models, people capability maturity model(P-CMM), other people focused models in the literature, how does an organization choose the models to use?

<b>Teaching-Learning Process</b>	Chalk and talk/PPT/case study/web content: <a href="https://youtu.be/Ih17DPBAZ1g">https://youtu.be/Ih17DPBAZ1g</a>
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**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:**

- Ramesh Gopaldaswamy: "Managing Global Projects ", Tata McGraw Hill, 2013.

**Refence Books:**

- Watts Humphrey, "Managing the Software Process ", Pearson Education, New Delhi, 2000
- Pankaj Jalote, "Software Project Management in practice", Pearson Education, New Delhi, 2002.

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

[https://onlinecourses.nptel.ac.in/noc19\\_cs70/preview 2.](https://onlinecourses.nptel.ac.in/noc19_cs70/preview 2)  
[https://www.tutorialspoint.com/software\\_engineering/software\\_requirements.htm 3.](https://www.tutorialspoint.com/software_engineering/software_requirements.htm 3)  
[https://prezi.com/p/9aroyjox8hce/globalization-issues-in-project-management/ 4.](https://prezi.com/p/9aroyjox8hce/globalization-issues-in-project-management/ 4)  
<https://www.youtube.com/watch?v=ZRaZVLRXctU>

**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 :

<b>Sl. No.</b>	<b>Description</b>	<b>Blooms Level</b>
C01	Identify the resources required for a project and to produce a work plan and resource schedule	L2
C02	Monitor the progress of a project and to assess the risk of slippage, revising targets counteract drift	L4
C03	Use appropriate metrics to management the software development outcome	L4,L5

<b>Program Outcome of this course</b>		
<b>Sl. No.</b>	<b>Description</b>	<b>POs</b>
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**

	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>Multimedia Communications</b>			
Course Code	MSCS215D	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>• 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: <a href="https://youtu.be/HorJOe2yl8Q">https://youtu.be/HorJOe2yl8Q</a>		
<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 : <a href="https://youtu.be/qz0aGYrrlhU">https://youtu.be/qz0aGYrrlhU</a>		
<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: <a href="https://youtu.be/6mbwj2xhgzM?list=PLu0W_9lII9agiCUZYRsvtGTxdxkzPyItg">https://youtu.be/6mbwj2xhgzM?list=PLu0W_9lII9agiCUZYRsvtGTxdxkzPyItg</a>		
<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: <a href="https://youtu.be/nVzrfog33j4">https://youtu.be/nVzrfog33j4</a>		
<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: <a href="https://youtu.be/6EukZDFE_Zg">https://youtu.be/6EukZDFE_Zg</a>		

**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 subquestions) 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, KlaraNahrstedt, 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=NPQWUwR6vQ&list=PL6wr\\_B29b3UR5weQ80W8aYMkxEAz92IIC](https://www.youtube.com/watch?v=NPQWUwR6vQ&list=PL6wr_B29b3UR5weQ80W8aYMkxEAz92IIC)

**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	Deploy the right multimedia communication models.	L3
CO2	Apply QoS to multimedia network applications with efficient routing techniques.	L3
CO3	Communicate clearly and concisely, visually, verbally and in writing, using techniques appropriate for the intended audience.	L2
CO4	Identify the basic components of a multimedia project.	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
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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**

	<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>MINI PROJECT WITH SEMINAR</b>			
Course Code	MSCS206	CIE Marks	50
Number of contact Hours/Week	3	SEE Marks	50
Credits	03	Exam Hours/Batch	03
<p><b>Course objectives:</b></p> <ul style="list-style-type: none"> <li>• To support independent learning and innovative attitude.</li> <li>• To guide to select and utilize adequate information from varied resources upholding ethics.</li> <li>• To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.</li> <li>• To develop interactive, communication, organization, time management, and presentation skills.</li> <li>• To impart flexibility and adaptability.</li> <li>• To inspire independent and team working.</li> <li>• To expand intellectual capacity, credibility, judgement, intuition.</li> <li>• To adhere to punctuality, setting and meeting deadlines.</li> <li>• To instill responsibilities to oneself and others.</li> <li>• 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.</li> </ul>			
<p><b>Mini-Project:</b> 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.</p>			
<p><b>Course outcomes:</b> At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> <li>• Present the mini-project and be able to defend it.</li> <li>• 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.</li> <li>• Habituated to critical thinking and use problem solving skills.</li> <li>• Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.</li> <li>• Work in a team to achieve common goal.</li> <li>• Learn on their own, reflect on their learning and take appropriate actions to improve it.</li> </ul>			
<p><b>CIE procedure for Mini - Project:</b> 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.</p> <p><b>Semester End Examination</b> 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.</p>			

<b>NETWORK PROGRAMMING LABORATORY</b>			
Course Code	MSCSL207	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>• Create client and server applications using the "Sockets" API and the implementation of Data link layer protocol and TCP layer</li> <li>• Ability to conduct computer communication network simulations. Development of computer network simulation and modeling techniques using OPNET simulation software</li> </ul>			
<b>Sl.NO</b>	<b>Experiments</b>		
1	Write a C program to implement daytime client/server program using TCP sockets		
2	Write a TCP client/server program in which client sends three numbers to the server in a single message. Server returns sum, difference and product as a result single message. Client program should print the results appropriately		
3	Write a C program that prints the IP layer and TCP layer socket options in a separate file		
4	Exercises on Socket Programming using C and Java		
5	Exercises using OPNET Network Simulator <ol style="list-style-type: none"> <li>1. Setting up of various network topologies</li> <li>2. Implementation of various MAC protocols</li> <li>3. Measurement of routing protocols</li> <li>4. Analysis of TCP/IP protocol under various mechanisms</li> <li>5. Setting up of network that carries various application protocols and analyzing the performances</li> </ol>		
6	Comparison of TCP/IP, Socket, Pipes. Analyse which is the best		
<b>Course outcomes (Course Skill Set):</b>			
At the end of the course the student will be able to:			
<ul style="list-style-type: none"> <li>• Understanding of the working principle of Socket programming</li> <li>• Familiarization with the OPNET toolkit</li> </ul>			
<b>Assessment Details (both CIE and SEE)</b>			
<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. 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.</p>			
<b>Continuous Internal Evaluation (CIE):</b>			
CIE marks for the practical course is <b>50 Marks</b> .			
The split-up of CIE marks for record/ journal and test are in the ratio <b>60:40</b> .			
<ul style="list-style-type: none"> <li>• 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</li> </ul>			

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

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

##### **Reference Books**

- *UNIX Network Programming – Networking APIs: Sockets and XTI*, W. Richard Stevens
- *Computer Networks: A Systems Approach – Network Simulation Experiments in OPNET* L. Peterson and S. Davie



## 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.

### 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