Semester- III

Computer Networks			
Course Code	**MMCC311A**	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 Hrs

Course Learning objectives: At the end of the course, the student will be able to

- Familiarize the basic terminologies used for computer networking.
- Implement the computer networks concepts like TCP/IP, IPC and Congestion avoidance techniques
- Simulate the working of wired networks and analyze its performance

Module-1

Introduction: Data Communications, Networks, The Internet, Broadcast and Point-To Point Networks; Connectionless and Connection-Oriented Services; Network Devices; Network Topologies; Types of Network: LAN, MAN, WAN,PAN; Server Based LANs and Peer-to-Peer LANs; Transmission Types; Modes of Communication;

Module-2

Network Models: Design Issues of the Layer, Protocol Hierarchy, ISO-OSI Reference Model: Functions of each Layer; Various Terminology used in Computer Network; Connection-Oriented and Connectionless Services, Internet (TCP/IP) Reference Model, Comparison of ISO OSI and TCP/IP Model.

Module-3

Transmission Media: Transmission Medium, Guided Media: Coaxial Cable, Twisted Pair, Fiber Optics Cable; Unguided Media: Radio Waves, Infrared, Micro-wave, Satellite communication, Laser. Switching Techniques.

Module-4

Data Link layer: Data link layer design issues, Error Detection and Correction Codes, Data Link Protocols (Simplex Stop-and-wait protocol for Error free and noisy channel) and Sliding window protocols.

Network Layer: Network Layer Design issues, Routing algorithms, Congestion Control Algorithms, Quality of Service, Internetworking and The Network Layer in the Internet.

Module-5

The Transport Layer: The Transport Service, Elements of Transport Protocols, Congestion Control, The Internet Transport Protocol: UDP, The Internet Transport Protocols – TCP.

The application Layer: DNS: Domain Name Space, Domain Resource Records, Domain Name Servers. Electronic mail: SMTP, The World Wide Web: Static and dynamic web pages, web applications, HTTP, mobile web. Streaming audio and Video: Digital audio and video, streaming stored and live media, Content delivery: Content and internet traffic, content delivery networks, peer-to-peer networks.

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. Behrouz A. Forouzan,: Data Communication and Networking, 4 th Edition Tata McGraw-Hill, 2006.
2. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.
3. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
4. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
5. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007.

Weblinks and Video Lectures (e-Resources):

- https://www.binghamton.edu/watson/continuing-education/data-science/intro-to-computer-networks.html
- https://elearn.daffodilvarsity.edu.bd/course/view.php?id=5457
- https://onlinecourses.nptel.ac.in/noc21_cs18/preview

Skill Development Activities Suggested

- The students with the help of the course teacher can take up technical –activities which will enhance their skill or the students should interact with industry (small, medium and large), understand their problems or foresee what can be undertaken for study in the form of research/testing/projects, and for creative and innovative methods to solve the identified problem. 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	Apply the basic concepts of networks like protocol, internet and OSI layers	L3
CO2	Analyze the working of Physical Layer.	L3
CO3	Demonstrate the various Switching networks	L3

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1							
CO2		**2**					1	
CO3		**2**	**3**					

Semester-III

Network and Linux Administration			
Course Code	**MMCC311B**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- Set up and manage network interfaces, IP addresses, and network services.
- Configuration of firewalls using ip tables, NAT, and secure Linux networks.
- To Manage Network Services – Work with DNS, DHCP, remote login, and web server configurations.
- To Diagnose network issues and optimize performance using Linux tools.

Module 1:

Introduction to Networking :History and evolution of computer networking Basic network components and models **TCP/IP Networks** :Layers of the TCP/IP model Understanding IP addresses, subnetting, and classes The Internet Control Message Protocol (ICMP) **Linux Networking Basics :**Maintaining your Linux system for networking networking interfaces and configuration in Linux Overview of the /proc file system.

Module 2:

Configuring Serial Hardware : Communications software for modem links Accessing and managing serial devices Configuration utilities for serial communication **TCP/IP Configuration :** Understanding /proc for network-related data Configuring Linux-based TCP/IP networking **Name Services and DNS :**Resolver library overview How DNS works and alternatives to BIND.

Module 3:

Point-to-Point Protocol in Linux Running pppd and using options files, Automating dialing with chat ,IP configuration and link control options Security considerations and authentication in PPP **Advanced PPP Configurations :** Debugging PPP setups, PPPoE options in Linux, **Networking Security & Firewalls :** Understanding network security threats, Firewall concepts and IP filtering basics.

Module 4:

TCP/IP Firewalls : Methods of attack and security considerations, Netfilter and iptables basics, Setting up and managing Linux firewalls, **IP Masquerade & Network Address Translation:** Configuring the kernel for IP Masquerade, Handling NAT and DNS lookups **IP Accounting & Network Monitoring :** Configuring IP accounting Collecting and analyzing network data.

Module 5

Network Services and Remote Access : Understanding inetd, tcpd, and xinetd, Remote Procedure Call (RPC) configuration,Remote login and execution services **IPv6 & Web Server Configuration :**IPv4 limitations and introduction to IPv6, Configuring IPv6 networks in Linux, Apache Web Server setup and configuration. **Wireless Networking:** History and standards of wireless networking, Security concerns in 802.11b networks.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

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

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

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

Semester-End Examination:

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

Suggested Learning Resources:

Text Books:

1. **"Linux Network Administrator's Guide"** – Tony Bautts, Terry Dawson, Gregor N. Purdy 3rd edition

Reference Books:

1. "Computer Networking: A Top-Down Approach" – James F. Kurose & Keith W. Ross
   A great introduction to networking concepts, covering application-layer protocols, TCP/IP, and security.
   Link
2. "Linux Firewalls: Enhancing Security with nftables and Beyond" – Steve Suehring
   A comprehensive guide on firewall security, iptables, and nftables in Linux.
   Link
3. "Mastering Linux Network Administration" – Jay LaCroix
   Covers advanced Linux networking topics, including system administration and server configuration.
   Link

Weblinks and Video Lectures (e-Resources):

1. **Computer Networking Full Course** (Beginner-Friendly)
   - https://www.youtube.com/watch?v=qiQR5rTSshw (NetworkChuck – Cisco Basics & TCP/IP)
2. **Linux Networking & Firewall Setup**
   - https://www.youtube.com/watch?v=zA42YPS52Xo (TechWorld with Nana – Linux Networking Guide)
3. https://youtu.be/_eY4IfpbRDs?si=vHeCLsgFewCGJw3t

Skill Development Activities Suggested

Server Setup and Administration

- Install and configure Apache Web Server, DNS, and DHCP in Linux.
- Set up remote login (SSH) and secure authentication mechanisms.
- Set up and configure static & dynamic IP addressing using Linux commands.
- Use the ping, trace route, and net stat tools to diagnose network issues.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Learn about network setup, IP addresses, and how computers communicate.	L1
CO2	Configure internet connections, share files, and manage network settings.	L2
CO3	Protect a system from hackers by setting up firewall rules and security measures.	L3

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	**1**	**2**						
CO2		**2**		**3**				
CO3	**1**	**2**			**3**			**3**

Semester- III

TCP/IP			
Course Code	**MMCC311C**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- This course provides a solid foundation for understanding the communication process of the Internet.
- The student will understand the fundamental concepts of computer networking in the context of the TCP/IP model and protocols.
- 3. To study classful and classless addressing, IPV4,IPv6, UDP, TCP, congestion control and flow control.

Module-1

TCP/IP Protocol Suite - Protocol Layers, The TCP/IP Protocol suite and Addressing.IPV4 Addresses-Introduction, Classful and Classless Addressing, Internet Protocol Version4 (IPv4) – Datagram's, Fragmentation, Options, Checksum, Security, IP Package.

Module-2

Introduction to the Transport Layer: Transport Layer Services and Protocols. User Datagram Protocol (UDP) :Introduction,
User Datagram, UDP Services and Applications, UDP Package.

Module-3

Transmission Control Protocol – I: TCP Services: Process-to-Process Communication, Full-Duplex Communication, Multiplexing and De-multiplexing, Reliable Service, Connection-Oriented Service Features, Segment, TCP Connection, Windows in TCP.

Module-4

Transmission Control Protocol – II: Flow Control, Error Control, Congestion Control, TCP Timers, Options and TCP Package.

Module-5

IPv6 Addressing – Introduction, Address Space Allocation, Global Unicast Addresses, Auto configuration and Renumbering. IPv6 Protocol - Introduction, Packet Format, Transition from IPv4 to IPv6. ICMPv6 - Introduction, Error Messages, Informational Messages, Neighbor- Discovery Messages, Group Membership Messages.

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. TCP/IP Protocol Suite, Behrouz A. Forouzan, 4th Edition, Tata McGraw-Hill Edition.
2. Data communication and Networking with TCP/IP Protocol Suite, Behrouz A. Forouzan, 6th Edition, Tata McGraw-Hill Edition.
3. The TCP/IP Tutorial and Technical Overview Adolfo Rodriguez, John Gatrell, John Karas, Roland Peschke

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=TBHHCd_9tz8
- https://www.youtube.com/watch?v=7GnSWC7ClNs

Skill Development Activities Suggested

- **Activity:** Study TCP/IP Model Layers: Learn about the four layers (Transport, and Transmission I and II) and how they compare to the OSI model.
- **Skills Developed:** Get the idea of the depth of Computer Networks.
- **Activity:** Protocol Deep Dive Explore protocols like TCP, IP, UDP etc.
- **Skills Developed:** Understanding the about the protocols and its use

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Understanding of TCP/IP Architecture	L2
CO2	Identify and assign **IPv4 & IPv6 addresses** effectively.	L3
CO3	TCP & UDP Transmission Mechanisms	L3

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	**1**		**2**					
CO2		**2**		**3**				
CO3	**1**		**3**			**3**		

Semester- III

Unix Shell Programming			
Course Code	**MMCC311D**	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

Course Learning objectives:

- This course will enable students to
- To help the students to understand effective use of Unix concepts, commands and terminology. Identify, access, and evaluate UNIX file system
- Explain the fundamental design of the Unix operating system
- Familiarize with the systems calls provided in the Unix environment
- Design and build an application/service over the Unix operating system

Module-1

Introduction: Unix Components/Architecture. Features of Unix. The UNIX Environment and UNIX Structure, Posix and Single Unix specification. General features of Unix commands/ command structure. Command arguments and options. Basic Unix commands such as echo, printf, ls, who, date, passwd, cal, Combining commands. Meaning of Internal and external commands. The type command: knowing the type of a command and locating it. The root login. Becoming the super user: su command. Unix files: Naming files. Basic file types/categories. Organization of files. Hidden files. Standard directories. Parent-child relationship. The home directory and the HOME variable. Reaching required files- the PATH variable, manipulating the PATH, Relative and absolute pathnames. Directory commands – pwd, cd, mkdir, rmdir commands. The dot (.) and double dots (..) notations to represent present and parent directories and their usage in relative path names. File related commands – cat, mv, rm, cp, wc and od commands.

Module-2

File attributes and permissions: The ls command with options. Changing file permissions: the relative and absolute permissions changing methods. Recursively changing file permissions. Directory permissions. The shells interpretive cycle: Wild cards. Removing the special meanings of wild cards. Three standard files and redirection. Connecting commands: Pipe. Basic and Extended regular expressions. The grep, egrep. Typical examples involving different regular expressions. Shell programming: Ordinary and environment variables. The. profile. Read and read-only commands. Command line arguments. exit and exit status of a command. Logical operators for conditional execution. The test command and its shortcut. The if, while, for and case control statements. The set and shift commands and handling positional parameters.

Module-3

Unix Standardization and Implementations: Introduction, Unix Standardization, UNIX System Implementation. File I/O: Introduction, File Description, open, create, read, write, close, fcntl functions. Files and Dictionaries: mkdir and rmdir functions, reading dictionaries, chdir, fchdir and getcwd functions. Device Special files. The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions.

Module-4

Process Control: Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions. Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores. Shared Memory, Client-Server Properties, Passing File Descriptors, An Open Server-Version 1.

Module-5

Signals and Daemon Processes: Introduction, Signal Concepts, Signal Functions, SIGCLD Semantics, Kill and Raise functions, Alarm and Pause Functions, Signal Sets, sigprocmask Function, sigpending function, sigaction function, sigsetjmp and siglongjmp functions, sigsuspend function, abort function, system function, sleep, nanosleep and clock_nanosleep functions, sigqueue functions, job-control signals, signal names and numbers. Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model.

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. Sumitabha Das., Unix Concepts and Applications., 4thEdition., Tata McGraw Hill

2. W. Richard Stevens: Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education, 2005

Reference Books:

1. Unix System Programming Using C++ - Terrence Chan, PHI, 1999.

2. M.G. Venkatesh Murthy: UNIX & Shell Programming, Pearson Education.

3. Richard Blum, Christine Brenham: Linux Command Line and Shell Scripting Bible, 2ndEdition, Wiley, 2014.

Weblinks and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=ffYUfAqEamY
- https://www.youtube.com/watch?v=Q05NZiYFcD0
- https://www.youtube.com/watch?v=8GdT53KDIyY
- https://www.youtube.com/watch?app=desktop&v=3Pga3y7rCgo

Skill Development Activities Suggested

- Demonstrate the basics of Unix concepts and commands.
- Demonstrate the UNIX file system.
- Apply comands to reflect changes in file system.
- Demonstrate IPC and process management.
- Develop an application/service over a Unix system.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Understand UNIX basics, navigate files and directories and use command-line interfaces.	L1
CO2	Manage user accounts, permissions, and system resources, create and edit files.	L2
CO3	Apply advanced UNIX concepts, including shell scripting, troubleshooting, and networking/security features.	L2,L3

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	**1**			**2**				
CO2		**2**			**3**			
CO3	**1**		**3**				**3**	

Semester- III

Cloud Essentials			
Course Code	**MMCC311E**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- Explain the fundamentals of cloud
- Analyse Business Benefits and Risks of Cloud Computing.
- Evaluate Emerging Trends in Cloud Computing

Module-1

Introduction to Cloud: Defining a cloud, Characteristics of Cloud Computing, Cloud computing reference model, Architectures for parallel and distributed computing, Elements of parallel computing and Elements of distributed computing.

Cloud Service Models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Function as a Service (FaaS), Blockchain-as-a-Service (BaaS) and use cases, Cloud Deployment Models: Public Cloud, Private Cloud, Hybrid and Multi-Cloud, Community Cloud.

Module-2

Core Components of Cloud Architecture: Compute Services, Storage Services, Networking Services, Virtualization, Types of Virtualization, Containers vs. Virtual Machines (VMs), Load Balancing in Cloud, Auto-Scaling & Fault Tolerance, Content Delivery Networks(CDN), Bare Metal Cloud ,Cloud Orchestration and Automation.

Module-3

Cloud Automation, DevOps, and Future Innovations: Cloud Automation and Infrastructure as Code (IaC), DevOps and Continuous Integration/Continuous Deployment (CI/CD), Multi-Cloud and Hybrid Cloud Strategies, Sustainability and Green Cloud Computing, Cloud Innovations- AI-powered cloud automation-5G and its impact on cloud computing.

Module-4

Cloud Security & Risk Management: Cloud Adoption, Advantages and Challenges of Cloud Adoption, Security Risks in Cloud- Data Breaches, Identity Theft, Network Security in Cloud.

Security Solutions in Cloud: Identity and Access Management (IAM), Data Encryption Techniques, Firewalls & Intrusion Detection Systems: Compliance & Regulatory Frameworks, Disaster Recovery and Business Continuity Planning in Cloud.

Module-5

Emerging Trends and case study: AI, Edge Computing, Quantum Cloud, Event-driven architecture in cloud, Cloud-based AI services -AWS SageMaker, Google Vertex AI, Azure ML.

Case Study: Netflix's Cloud Migration, Zoom's Cloud Scalability.

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. **CompTIA Cloud Essentials+ Study Guide: Exam CLO-002 [2 ed.].**
2. Rajkumar Buyya, Christian Vecchiola, and Thamrai Selvi Mastering Cloud Computing McGraw Hill Education.
3. Handbook of Cloud Computing, Borko Furht- Armando Escalante.
4. Cloud Essentials: CompTIA Authorized Courseware for Exam CLO-001.
5. RjkumarBuyya, Christian Vecchiola, and ThamaraiSelci, Mastering Cloud Computing, Tata McGraw Hill, New Delhi, India, 2013.

Reference Book

1. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M. Kanfman, F.Halper (Wiley India Edition)
2. Toby Velte, Anthony Velte, Cloud Computing: A Practical Approach, McGraw-Hill Osborne Media

Weblinks and Video Lectures (e-Resources):

- . https://youtu.be/dUpwh5XgxsA?si=pF4mgT2n5W7nyQFc
- https://www.youtube.com/watch?v=1N3oqYhzHv4
- https://www.youtube.com/watch?v=RWgW-CgdIk0

Skill Development Activities Suggested

- **Activity:** Develop a small web application using **PaaS** platforms like **Google App Engine** or **Heroku**
  Skills Developed: Hands-on experience with Platform-as-a-Service, web application hosting.
- **Activity:** Create and manage a free-tier account on **AWS, Azure, or Google Cloud Platform (GCP)**
  Skills Developed: Basic cloud navigation, account setup, and cloud resource management

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	Demonstrate the fundamental concepts of cloud computing.	L2
CO2	Understand Cloud Security Challenges	L2
CO3	Understand and Explain Cloud Compute Services and Analyze Cloud Networking Services	L2
CO4	Compare different deployment and service models of cloud to develop different variety of applications with securities	L2

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	**2**							
CO2	**2**	**2**			**2**			
CO3	**2**	**2**			**3**			
CO4	**2**	**3**		**3**				**3**

Semester- III

Introduction to ERP and SAP Basis Administration			
Course Code	**MMCC311F**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- Explain the objectives, importance, and decision phases of supply chain management.
- Evaluate ERP Implementation Processes
- Analyze the ERP Market and Leading Vendors
- Explain SAP system architecture, installation, and administration processes.

Module-1

Introduction to Supply Chain Management: Supply chain – objectives – importance – decision phases – process view – competitive and supply chain strategies – achieving strategic fit – supply chain drivers – obstacles – framework – facilities – inventory – transportation – information – sourcing – pricing.

Module-2

ERP Implementation: Implementation of Life Cycle, Implementation Methodology, Hidden Costs, Organizing Implementation, Vendors, Consultants and Users, Contracts, Project Management and Monitoring

Module-3

ERP Market: ERP Market Place, SAP AG, People Soft, Baan Company, JD Edwards World Solutions Company, Oracle Corporation, QAD, System Software Associates.

Module-4

Introduction to SAP Basis: System architecture, Installation/administration. User and role management, Transport Management System (TMS), Job\spool management, and database administration. System monitoring, troubleshooting, performance optimization, focusing on work processes, buffer tuning and memory management.

Module-5

Advanced SAP Basis & HANA: SAP patch management, system upgrades, security, audit logs, user access monitoring, backup and disaster recovery strategies. A brief introduction to SAP HANA: architecture , basic administration and case studies.

Assessment Details (both CIE and SEE)

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

Continuous Internal Evaluation:

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

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

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

ERP assignments (Open-Source ERP Software to Use-Odoo (Community Edition)/ ERPNext/ Dolibarr**)**
1. Create a Company Profile – Set up a company in Odoo/ERPNext, enter details, and save.
2. Add a Product & Update Inventory – Create a product, set price & stock, then adjust inventory.
3. Generate a Sales Invoice – Create a customer, add a sales order, generate & export an invoice.
4. Add an Employee & Process Payroll – Create an employee, set salary, generate a payslip.
5. Generate a Business Report – Create a Sales, Inventory, or Financial Report, then export.

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. **"Supply Chain Management: Strategy, Planning, and Operation"** – *Sunil Chopra, Peter Meindl*
2. **"Enterprise Resource Planning: Fundamentals of Design and Implementation"** – *K. Ganesh, Sanjay Mohapatra*
3. **"SAP Basis Administration Handbook, NetWeaver Edition"** – *Ranjit Mereddy*
4. **"SAP HANA Administration"** – *Richard Bremer, Lars Breddemann*

Web links and Video Lectures (e-Resources):

- https://training.sap.com/content/sap-logistic-supply-chain
- https://www.sap.com/products/erp/what-is-erp.html.
- https://youtu.be/uuF746PiZ9k

Skill Development Activities Suggested

- **Hands-on ERP System Exploration** – Use an open-source ERP system like **Odoo** or **ERPNext** to understand real-world implementation, role management, and basic configurations.
- **Supply Chain Case Study Analysis** – Analyze a company's supply chain (e.g., Amazon, Toyota) to identify key drivers, challenges, and strategic decisions, then present findings in a report or presentation.

Course outcome (Course Skill Set)

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

Sl. No.	Description	Blooms Level
CO1	Analyse the essentials of supply chain management in ERP.	L2
CO2	Analyse the implementation of ERP in the context of business of the different organization	L3
CO3	Analyse the given case study of ERP marketing.	L3

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1		**1**	**2**					
CO2		**2**	**1**	**3**				
CO3			**2**		**3**			