MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST

RAJARAJESWARI COLLEGE OF ENGINEERING

An Autonomous Institution

Under VTU, Approved by AICTE, UGC & GoK

No. 14, Ramohalli Cross, Kumbalagodu, Mysore Road, Bengaluru

SCHEME & SYLLABUS

PG PROGRAM

M.Tech (CSE)

2nd Semester

Effective from the Academic Year

2024-25

For more information

www.rrce.org

RAJARAJESWARI COLLEGE OF ENGINEERING

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Under VTU - Belagavi, Approved by AICTE, UGC & GoK

NBA NATIONAL BOARD OF ACCREDITATION CSE, ECE, ISE

No. 14, Ramohalli Cross, Kumbalagodu, Mysore Road, Bengaluru - 560074

A+ NAAC

Institute Vision

To empower young minds through technology, research, and innovation, to produce technically competent and socially responsible professionals in higher education.

Institute Mission

To deliver excellence in education through innovative teaching, impactful research, and continuous skill development, preparing students to meet global challenges with technical expertise and ethical responsibility.

To foster a transformative learning environment that integrates technology, research, and practical experience, empowering students to become skilled professionals and socially conscious leaders.

To cultivate a culture of lifelong learning and professional excellence by encouraging creativity, research, and community engagement, equipping students with the skills to thrive in a dynamic world.

To provide a holistic educational experience that combines advanced technology, hands-on research, and community-focused learning, shaping students into competent, ethical professionals who contribute positively to society.

Quality Policy

Rajarajeswari College of Engineering is committed to imparting quality technical education that nurtures competent, ethical professionals with global relevance. We ensure academic excellence through a dynamic, outcome-based curriculum, experienced faculty, and cutting-edge infrastructure. Continuous improvement is driven by innovation, research, and strong industry collaboration. We foster holistic development and a progressive environment that supports lifelong learning, teamwork, and professional growth.

Core Values

Academic Excellence, Integrity, Innovation, Global Competence, Continuous Improvement

MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST

Rajarajeswari College of Engineering

(An Autonomous Institution Under Visvesvaraya Technological University, Belagavi)
#14, Ramohalli Cross, Kumbalagodu, Mysore Road, Bengaluru - 560074

M.Tech – Computer Science and Engineering

Scheme

2024-25

II Semester

M.Tech in COMPUTER SCIENCE & ENGINEERING
Scheme of Teaching and Examinations–2024
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
II Semester (Effective from the Academic Year 2024-25)

Sl. No	Course Category and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination			
					Theory Lecture	Practical	T/SDA	Credits	Duration in Hours	CIE Marks	SEE Marks	Total Marks
					L	P	S					
1.	PCC	P24SCS201	Advanced operating System	CSE	3	0	2	04	03	50	50	100
2.	IPCC	P24 SCS 202	Advances in computer Networks	CSE	3	2	0	04	03	50	50	100
3.	PCC	P24 SCS 203	Network programming	CSE	3	0	0	03	03	50	50	100
4.	PCC	P24 SCS X 214	Professional Elective - 1	CSE	3	0	0	03	03	50	50	100
5.	PCC	P24SCS X 215	Professional Elective - 2	CSE	3	0	0	03	03	50	50	100
6.	Proj	P24SCSP206	Mini Project with Seminar	CSE	0	6	0	03	03	50	50	100
7.	PCCL	P24SCSL207	Network Programming Lab	CSE	0	2	0	01	03	50	50	100
8.	SEC	P24SCS208	Skill Enhancement For Research Excellence - 1	CSE	1	0	0	01	03	50	50	100
			TOTAL		16	10	02	22		400	400	800

Note: PCC: Professional core. IPCC-Integrated Professional Core Courses, PCCL-Professional Core Course lab, L-Lecture, P-Practical, T/SDA-Tutorial / Skill Development Activities, SEC: Skill Enhancement Course, PEC: Professional Elective Courses, Proj: Project

Professional Elective - 1		Professional Elective - 2	
Course Code	**Name of the Course**	**Course Code**	**Name of the Course**
P24 SCS A 214	Blockchain Technology	P24 SCS A 215	Computer Vision
P24SCS B 214	Information and Network Security	P24 SCS B 215	Wireless Network and Mobile Computing
P24SCS C 214	Deep Learning	P24 SCS C 215	Software Project Planning and Management
P24SCS D 214	Decision Support Systems	P24 SCS D 215	Multimedia Communications

PG- Coordinator

HOD

Dr. D. KIRUBHA
Head of the Department,
Computer Science and Engineering,
Rajarajeswari College of Engineering,
Bangalore - 560 074.

Dean- Academics

DEAN ACADEMICS
Rajarajeswari College of Engineering
Bengaluru - 560 074.

Principal

Principal
RAJARAJESWARI
COLLEGE OF ENGINEERING
Ramohalli Cross, Bengaluru-74

MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST

Rajarajeswari College of Engineering

(An Autonomous Institution Under Visvesvaraya Technological University, Belagavi)
#14, Ramohalli Cross, Kumbalagodu, Mysore Road, Bengaluru - 560074

M.Tech – Computer Science and Engineering

Syllabus

2024-25

II Semester

M.Tech in Computer Science & Engineering					
SEMESTER II					
Advanced Operating System **Category:** PCC (Theory)					
Course Code	:	**P24SCS201**	CIE	:	50 Marks
Teaching Hours L : P : SDA	:	3:0:2	SEE	:	50 Marks
Total Hours	:	45 Hours	Total	:	100 Marks
Credits	:	4	SEE Duration	:	3 Hrs

Course Objectives	
1	Analyze the characteristics of operating systems for multiprocessor and multicomputer architectures
2	Understand and address the challenges related to designing operating systems
3	Explore the latest trends in developing mobile operating systems
4	Evaluate the implications of these trends on performance and user experience.
5	Analyze how architectural differences influence operating system design and functionality.

Module 1	**No. of Hrs.**
Multiprocessor Operating Systems: System Architectures- Structures of OS – OS design issues – Process synchronization – Process Scheduling and Allocation- Memory Management.	9
Module 2	**No. of Hrs.**
Distributed Operating Systems: System Architectures- Design issues – Communication models – clock synchronization – mutual exclusion – election algorithms- Distributed Deadlock detection.	9
Module 3	**No. of Hrs.**
Distributed scheduling - Distributed shared memory - Distributed File system – Multimedia file systems – File placement – Caching.	9
Module 4	**No. of Hrs.**
Database Operating Systems: Requirements of Database OS – Transaction process model – Synchronization primitives - Concurrency control algorithms.	9
Module 5	**No. of Hrs.**
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.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Analyze the characteristics of operating systems for multiprocessor and Multi computer architectures.
CO2	Understand and address the challenges related to designing operating systems and their implications.
CO3	Explore the latest trends in developing mobile operating systems and evaluate their impact on performance
CO4	To equip students with a deep understanding on transaction processing models, synchronization mechanisms, and concurrency control algorithms
CO5	To provide students with a comprehensive understanding of mobile operating system design across ARM and Intel architectures

Text Books	
1	M Singhal and NG Shivaratri , Advanced Concepts in Operating Systems, Tata McGraw Hill Inc, 2001
Reference Text Books	
1	A S Tanenbaum, Distributed Operating Systems, Pearson Education Asia, 2001
2	Source Wikipedia, Mobile Operating Systems, General Books LLC, 2010

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	-	-	-	-	-	1	1
CO2	3	3	3	3	2	-	-	-	-	-	1	1
CO3	3	3	3	3	2	-	-	-	-	-	1	1
CO4	3	3	3	3	2	-	-	-	-	-	1	1
CO5	3	3	3	3	2	-	-	-	-	-	1	1

*3-Highly mapped 2-Moderately mapped 1-Slightly mapped

4 credit Courses: (L:P:SDA 3:0:2)

Component	**Evaluation Criteria**	**Marks Allocation**
CIE - Theory Component (50 Marks)		
Internal Assessment Test 1	Covers 30% of the syllabus (50 marks, 1.5-hour duration)	50
Internal Assessment Test 2	Covers 70% of the syllabus (50 marks, 1.5-hour duration)	50
Internal Assessment Test 3	Covers 100% of the syllabus (50 marks, 1.5-hour duration)	50
a. Total Internal Assessment (**Scaled Down)**	Best of 2 and Average of 2 Test	30
b. Seminar Presentation	Seminar presentation 1 & 2 - Average of 2 Presentation (Each 10 marks)	10
c. Assignment	Assignments 1,2 – Average of 2 assignments (Each 10 marks)	10
Total a+b+c	Sum of Tests + Assignment+ Seminar	**50**

Minimum passing marks	50% (25/50) of the maximum marks of CIE	
SEE - Theory Component (50 Marks)		
Minimum passing marks	40% of the maximum marks of SEE. (**Scaled Down to 50 :** Minimum marks : 20/50**)**	100
Passing Criteria for CIE +SEE (Theory)	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.	

M.Tech in Computer Science & Engineering					
Semester II					
Advances in Computer Networks **Category:** IPCC (Theory + Practical)					
Course Code	:	**P24SCS202**	CIE	:	50 Marks
Teaching Hours L:P:SDA	:	3:2:0	SEE	:	50 Marks
Total Hours	:	45(T) +10 (P)	Total	:	100 Marks
Credits		4	SEE Duration	:	3 Hrs.

Course Objectives	
1	Students will be able to explain various network protocols of their respective layers.
2	To introduce students to the foundational concepts and mechanisms of internetworking, including switching, bridging, IP-based communication, addressing, and core protocols
3	To provide students with an in-depth understanding of advanced internetworking concepts, including dynamic routing protocols, inter-domain routing, IPv6, and mobility support
4	To develop a thorough understanding of end-to-end communication protocols, particularly UDP and TCP, with emphasis on reliability, flow and congestion control, protocol mechanisms, and performance optimization
5	To explore key internet application protocols and network management systems such as DNS, email protocols, HTTP, and SNMP.

Module - 1	No of Hrs.
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.	9
Module - 2	No of Hrs.
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.	9
Module - 3	No of Hrs.
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	9
Module - 4	No. of Hrs.
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	9
Module - 5	No. of Hrs.
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)	9

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

CO1	Identify the vulnerabilities in any computing system and hence be able to design a security solution
CO2	Identify the security issues in the network and resolve it.
CO3	Analyze security mechanisms using rigorous approaches, including theoretical
CO4	Apply various protocols for network security to protect against the threats in the networks
CO5	To analyze and apply congestion control mechanisms and resource allocation strategies in computer networks, and demonstrate working knowledge of key internet protocols

Text Books	
1	Computer Networks: A System Approach, Larry Peterson and Bruce S Davis, Elsevier, 5th Edition 2014
2	Internetworking with TCP/IP, Principles, Protocols and Architecture, Douglas E Comer, PHI, 6th Edition 2014.
Reference Text Books	
1	Computer Networks, Protocols, Standards and Interfaces, Uyless Black , PHI, 2 nd Edition
2	TCP /IP Protocol Suite, Behrouz A Forouzan, Tata McGraw-Hill, 4 th Edition

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

Sl.NO	Experiments
Note: Implement the following using C/C++ or equivalent with LINUX/Windows environment:	
1	Write a program to archive Traffic management at Flow level by implementing Closed Loop Control technique. (Leaky Bucket Algorithm)
2	Write a program to implement dynamic routing strategy in finding optimal path for data transmission. (Bellman ford algorithm).
3	Write a program to implement Link State Routing (Dijkstra Algorithm).
4	Write a program for providing security for transfer of data in the network. (RSA Algorithm)
5	Write a program for encrypting 64 bit playing text using DES algorithm.
6	Apply the RSA algorithm on a text file to produce cipher text file
7	Develop a mechanism to setup a security channel using Diffie-Hellman Key Exchange between client and server
8	Implement secure hash algorithm for Data Integrity. Implement MD5 and SHA-1 algorithm, which accepts a string input, and produce a fixed size number - 128 bits for MD5; 160 bits for SHA-1, this number is a hash of the input. Show that a small change in the input results in a substantial change in the output.
	Simulation Programs using OPNET /NS2/NS3 or any other equivalent software 9.
9	Simulate a 3 node point to point network with duplex links between them. Set the Queue size and vary the bandwidth and find the number of packets dropped.
10	Simulate a four-node point-to-point network, and connect the links as follows: n0->n2, n1- >n2 and n2->n3. Apply TCP agent changing the parameters and determine the number of packets sent/received by TCP/UDP

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	-	-	-	-	-	-	-	3
CO2	3	3	2	3	-	-	-	-	-	-	-	3
CO3	3	3	2	3	-	-	-	-	-	-	-	3
CO4	3	3	2	3	-	-	-	-	-	-	-	3
CO5	3	3	2	3	-	-	-	-	-	-	-	3

*3-Highly mapped 2-Moderately mapped 1-Slightly mapped

4 Credit courses (L:P:SDA 3:2:0):

Component	Evaluation Criteria	Marks Allocation
CIE - Theory Component (25 Marks)		
Internal Assessment Test 1	Covers 30% of the syllabus (50 marks,1:30 hr duration)	50
Internal Assessment Test 2	Covers 70% of the syllabus (50 marks, 1:30 hr duration)	50
Internal Assessment Test 3	Covers 100% of the syllabus (50 marks, 1:30 hr duration)	50
Total Internal Assessment	**Best of Two and Average of Two Tests**	**30**
Assessment Methods	Any two assessment methods as per regulations i.e. Assignment/Quiz/Seminar/Group Discussion/Case Studies/Practical orientation on Design Thinking/ problem Solving Exercises/Presentation of Research work/hack-a-thon/Code-a-thon conducted by reputed organizations/ any other	**20**
Total marks scored **(30+20 = 50 marks) scale down to 25 Marks.**		

IPCC- CIE - Practical Component (25 Marks)		Conduction	Scaled down to
Lab Conduction	Average of Experiments - Conduction+ Record+ VIVA	10	5
Practical Internal Test	Conducted after all lab sessions	50	20
Sum of Lab conduction& Practical Internal Test		**25**	
CIE maximum marks – CIE Theory (25) + CIE Practical (25) = 50 Marks Minimum Passing marks is 50% in CIE - 25/50			

SEE - Theory Component (50 Marks)		
Minimum passing marks	40% of the maximum marks of SEE (**Scaled Down to 50 :** Minimum marks : 20/50**)**	100
Passing Criteria for CIE +SEE (Theory)	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	

M.Tech in Computer Science & Engineering					
Semester II					
Network Programming **Category:** PCC (Theory)					
Course Code	:	**P24SCS203**	CIE	:	50 Marks
Teaching Hours L:P: SDA	:	3:0:0	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits		3	SEE Duration	:	3 Hrs.

Course Objectives	
1	Define the key protocols which support the Internet
2	Explore working of the TCP/UDP Sockets
3	Demonstrate applications using techniques such as multiplexing, forking, multithreading
4	To enable them to implement Unix domain protocols for both stream and datagram client/server communication models.
5	To enable students to understand and implement various TCP-based client/server design models, exploring iterative, concurrent, preforked, and multithreaded architectures

Module - 1	No. of Hrs.
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	9
Module - 2	No. of Hrs.
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, getcsockname and getpeername functions and TCP Client/Server Example.	9
Module - 3	No. of Hrs.
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.	9
Module - 4	No. of Hrs.
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 .	9
Module - 5	No. ofHrs.
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.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain the concept of Networking and Transport Layer: TCP, UDP and SCTP
CO2	Illustrate the working of Sockets
CO3	To implement and optimize I/O multiplexing techniques using functions like select, pselect, and poll, and efficiently handle socket options and buffering in networked applications
CO4	To effectively utilize advanced I/O functions such as socket timeouts, recv, send, readv, writev, and sendmsg/recvmsg,
CO5	Implement, and evaluate various TCP-based client/server architectures, applying appropriate synchronization techniques, connection handling models, and inter-process communication mechanisms

Text Books	
1	UNIX Network Programming W. Richard Stevens, Bill Fenner, Andrew M. Rudoff Pearson Volume 1, Third Edition, 2004
Reference Text 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.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	-	-	-	-	-	1	1
CO2	3	3	3	3	2	-	-	-	-	-	1	1
CO3	3	3	3	3	2	-	-	-	-	-	1	1
CO4	3	3	3	3	2	-	-	-	-	-	1	1
CO5	3	3	3	3	2	-	-	-	-	-	1	1

*3-Highly mapped 2-Moderately mapped 1-Slightly mapped

3 credit Courses: (L: T: SDA 3:0:0)

Component	Evaluation Criteria	Marks Allocation
CIE - Theory Component (50 Marks)		
Internal Assessment Test 1	Covers 30% of the syllabus (50 marks, 1:30-hour duration)	50
Internal Assessment Test 2	Covers 70% of the syllabus (50 marks, 1:30-hour duration)	50
Internal Assessment Test 3	Covers 100% of the syllabus (50 marks, 1:30-hour duration)	50
a. Total Internal Assessment (**Scaled Down)**	Best of 2 and Average of 2 Test	30
b. Seminar Presentation	Seminar presentation 1 & 2 - Average of two Presentations (Each 10 marks)	10
c. Assignment	Assignments 1,2 – Average of two assignments (Each 10 marks)	10
Total a+b+c	Sum of Tests + Assignment+ Seminar	**50**
Minimum passing marks	50% (25/50) of the maximum marks of CIE	
SEE - Theory Component (50 Marks)		

Minimum passing marks	40% of the maximum marks of SEE. (**Scaled Down to 50 :** Minimum marks : 20/50**)**	100
Passing Criteria for CIE +SEE (Theory)	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.	

M.Tech in Computer Science & Engineering					
Semester II					
Deep Learning **Category:** PCC Professional Elective -I (Theory)					
Course Code	:	**P24SCSC214**	CIE	:	50 Marks
Teaching Hours L:P: SDA	:	3:0:0	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits		3	SEE Duration	:	3 Hrs.

Course Objectives	
1	Discuss the context of neural networks and deep learning
2	Have a working knowledge of neural networks and deep learning
3	Explore the parameters for neural networks
4	To provide students with an in-depth understanding of sequence modeling techniques, including recurrent and recursive neural networks, LSTMs, bidirectional RNNs, encoder-decoder architectures, and deep recurrent networks
5	To equip students with practical methodologies for building and optimizing machine learning models, including selecting performance metrics, determining data requirements

Module - 1	No. of Hrs.
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.	9
Module - 2	No. of Hrs.
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.	9
Module - 3	No. of Hrs.
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	9
Module - 4	No. of Hrs.
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	9
Module - 5	No. of Hrs.
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.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains
CO2	Implement deep learning algorithms and solve real-world problems
CO3	Execute performance metrics of deep learning Techniques
CO4	Compare modeling aspects of various neural networks architecture
CO5	To effectively apply performance metrics, select baseline models, determine data requirements, tune hyperparameters, and implement debugging strategies

Text Books	
1	Deep Learning, Lan Good fellow and YoshuaBengio, MIT Press https://www.deeplearn ingbook.org/ 2016.
Reference Text Books	
1	Neural Networks:Asystematic Introduction, Raúl Rojas, 1996.
2	Pattern Recognition and machine Learning, Chirstopher Bishop, 2007.

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	-	-	-	-	-	1	1
CO2	3	3	3	3	2	-	-	-	-	-	1	1
CO3	3	3	3	3	2	-	-	-	-	-	1	1
CO4	3	3	3	3	2	-	-	-	-	-	1	1
CO5	3	3	3	3	2	-	-	-	-	-	1	1

*3-Highly mapped 2-Moderately mapped 1-Slightly mapped

3 credit Courses: (L: T: SDA 3:0:0)

Component	**Evaluation Criteria**	**Marks Allocation**
CIE - Theory Component (50 Marks)		
Internal Assessment Test 1	Covers 30% of the syllabus (50 marks, 1:30 - hour duration)	50
Internal Assessment Test 2	Covers 70% of the syllabus (50 marks, 1:30 - hour duration)	50
Internal Assessment Test 3	Covers 100% of the syllabus (50 marks, 1:30 - hour duration)	50
a. Total Internal Assessment (**Scaled Down)**	Best of 2 and Average of 2 Tests	30
b. Seminar Presentation	Seminar presentation 1 & 2 - Average of two Presentations (Each 10 marks)	10

c. Assignment	Assignments 1,2 – Average of two assignments (Each 10 marks)	10
Total a+b+c	Sum of Tests + Assignment+ Seminar	**50**
Minimum passing marks	50% (25/50) of the maximum marks of CIE	
SEE - Theory Component (50 Marks)		
Minimum passing marks	40% of the maximum marks of SEE. (**Scaled Down to 50 :** Minimum marks : 20/50**)**	100
Passing Criteria for CIE +SEE (Theory)	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.	

M.Tech in Computer Science & Engineering					
Semester II					
Software Project Planning and Management **Category:** PCC Professional Elective - I (Theory)					
Course Code	:	**P24SCSC215**	CIE	:	50 Marks
Teaching Hours L:P: SDA	:	3:0:0	SEE	:	50 Marks
Total Hours	:	45	Total	:	100 Marks
Credits		3	SEE Duration	:	3 Hrs.

Course Objectives	
1	Enhance software delivery predictability and includes requirements gathering, planning and designing the product
2	Planning a framework enables the manager to make reasonable estimates of resources, cost, and schedule.
3	To equip students with practical knowledge and techniques for effective software requirements gathering, estimation, and system design, focusing on structured methodologies
4	To provide students with a thorough understanding of project management practices during the software testing and maintenance phases, including testing fundamentals, maintenance activities, configuration management
5	To enable them to effectively manage distributed teams and select appropriate process models for organizational success.

Module - 1	**No. of Hrs.**
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.	9
Module - 2	**No. of Hrs.**
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.	9
Module - 3	**No. of Hrs.**
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.	9

Module - 4	**No. of Hrs.**
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	9
Module - 5	**No. of Hrs.**
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?	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Identify the resources required for a project and to produce a work plan and resource schedule
CO2	Monitor the progress of a project and to assess the risk of slippage, revising targets counteract drift
CO3	Use appropriate metrics to management the software development outcome
CO4	To manage software projects effectively during the testing and maintenance phases by applying appropriate testing strategies, handling maintenance activities and issues, performing configuration and resource management
CO5	To analyze the challenges and strategies for managing global and internet-driven projects, and evaluate people-focused process models

Text Books	
1	Ramesh Gopalaswamy: “Managing Global Projects ", Tata McGraw Hill, 2013.
Reference Text Books	
1	Watts Humphrey, “Managing the Software Process “, Pearson Education, New Delhi, 2000
2	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://www.tutorialspoint.com/software_engineering/software_requirements.htm 3. https://prezi.com/p/9aroyjox8hce/globalization-issues-in-project-management/ 4. https://www.youtube.com/watch?v=ZRaZVLRXctU

CO-PO Mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	-	-	-	-	-	1	1
CO2	3	3	3	3	2	-	-	-	-	-	1	1
CO3	3	3	3	3	2	-	-	-	-	-	1	1
CO4	3	3	3	3	2	-	-	-	-	-	1	1
CO5	3	3	3	3	2	-	-	-	-	-	1	1

*3-Highly mapped 2-Moderately mapped 1-Slightly mapped

3 credit Courses: (L: T: SDA 3:0:0)

Component	Evaluation Criteria	Marks Allocation
CIE - Theory Component (50 Marks)		
Internal Assessment Test 1	Covers 30% of the syllabus (50 marks, 1:30-hour duration)	50
Internal Assessment Test 2	Covers 70% of the syllabus (50 marks, 1:30-hour duration)	50
Internal Assessment Test 3	Covers 100% of the syllabus (50 marks, 1:30-hour duration)	50
a. Total Internal Assessment (**Scaled Down)**	Best of 2 and Average of 2 Tests	30
b. Seminar Presentation	Seminar presentation 1 & 2 - Average of two Presentations (Each 10 marks)	10
c. Assignment	Assignments 1,2 – Average of two assignments (Each 10 marks)	10
Total a+b+c	Sum of Tests + Assignment+ Seminar	**50**
Minimum passing marks	50% (25/50) of the maximum marks of CIE	
SEE - Theory Component (50 Marks)		
Minimum passing marks	40% of the maximum marks of SEE. (**Scaled Down to 50 :** Minimum marks : 20/50**)**	100
Passing Criteria for CIE +SEE (Theory)	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.	

M.Tech in Computer Science & Engineering			
Mini Project with Seminar **Category :** Proj (Practical)			
Course Code	**P24SCSP206**	CIE Marks	50
Teaching Hours/Week (L:T:P:SDA)	0:0:6:0	SEE Marks	50
Credits	03	Exam Hours	03

Course objectives: This course will enable students to:

To support independent learning and innovative attitude.

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

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

Course outcomes:

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

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

CIE - Practical Component (50 Marks)

Project Report	20
Project Presentation skill	20
Question and Answer session	10
Total CIE Marks	**50**
Minimum 50% in CIE - Practical (25/50)	

SEE - Practical Component (100 Marks)

Practical Exam	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 College	100
Passing Criteria	Minimum 50% in SEE – (**Scaled Down to 50 :** Minimum marks : 25/50)	

Passing Criteria for CIE + SEE (Lab)	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.

M.Tech in Computer Science & Engineering			
Network programming Lab **Category :** PCCL (Practical)			
Course Code	**P24SCSL207**	CIE Marks	50
Teaching Hours/Week(L:T:P:SDA)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	03

Course objectives: This course will enable students to:

- Create client and server applications using the "Sockets" API and the implementation of Data link layer protocol and TCP layer
- Ability to conduct computer communication network simulations. Development of computer network simulation and modeling techniques using OPNET simulation software

Sl.NO	Experiments
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	Develop a C program to extract and save the socket options for both the IP and TCP layers into a separate output file
4	Exercises on Socket Programming using C and Java
5	Exercises using OPNET Network Simulator 1. Setting up of various network topologies 2. Implementation of various MAC protocols 3. Measurement of routing protocols 4. Analysis of TCP/IP protocol under various mechanisms 5. Setting up of network that carries various application protocols and analyzing the performances
6	Comparison of TCP/IP, Socket, Pipes. Analyse which is the best

Laboratory Outcomes: The student should be able to:

Course outcomes (Course Skill Set): At the end of the course the student will be able to:

- Understanding of the working principle of Socket programming
- Familiarization with the OPNET toolkit

PCCL - 1 Credit Course – Laboratory

CIE - Practical Component (50 Marks) + SEE - Practical Component (50 Marks)

CIE - Practical Component (50 Marks)		
Lab Conduction	Average of 10 Experiments - Conduction (10)+ Record (10)+ VIVA (10)	30
Practical Internal Test	Conducted after all lab sessions	20
Total	Sum of Lab conduction & Practical Internal Test	**50**
Passing Criteria	Minimum 50% in CIE - Practical (25/50)	

SEE - Practical Component (100 Marks)

Practical Exam	Write up + Execution + Report + VIVA	100
Passing Criteria	Minimum 50% in SEE - Practical (25/50) (**Scaled Down to 50 :** Minimum marks : 25/50	

Passing Criteria for CIE +SEE (Lab)	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.

M.Tech in Computer Science & Engineering					
Semester II					
Skill Enhancement for Research Excellence - 1 **Category:** SEC (Theory)					
Course Code	:	**P24SCS208**	CIE	:	50 Marks
Teaching Hours L:P:SDA	:	1:0:0	SEE	:	50 Marks
Total Hours	:	40	Total	:	100 Marks
Credits		1	SEE Duration	:	3 Hrs.

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
- **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 abstr acts 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

SEC- 1 Credit Course

CIE - Component (50 Marks) + SEE - Component (50 Marks)

CIE – Component (50 Marks)

CIE MARKS EVALUATION	
Base Papers Referred & Review	10 Marks
Presentations on Proposed Concepts	15 Marks
Preparation of Conference Papers (Preferably Scopus Indexed or Reputed Conferences)	25 marks
Total CIE marks	**50 Marks**
Minimum 50% in CIE - 25/50	

SEE - Component (100 Marks)

SEE MARKS EVALUATION	
Research Presentation Quality	50 Marks
Clarity of Concept & Methodology	30 Marks
Conference Submission & Acceptance/Presentation –	20 marks
Total SEE marks	**100 Marks**

Passing Criteria	Minimum 50% in SEE - 25/50 (**Scaled Down to 50 :** Minimum marks : 25/50

Passing Criteria for CIE +SEE (Lab)	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.

NOTE: 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.