



Sardar Patel Institute of Technology
Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Bharatiya Vidya Bhavan's
Sardar Patel Institute of Technology
(Autonomous Institute Affiliated to University of Mumbai)



Master Of Computer Applications

Third Year MCA

(Sem. V Sem. VI)

Effective from Academic Year 2020-21

Board of Studies Approval : 29th July 2020

Academic Council Approval : 26th March 2021

Dr. Pooja Raundale
HOD, MCA

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Principal



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TYMCA						
SEM V						
Course Code	Course Name	Group	Teaching Scheme (Hrs/week)			Credits
			L	T	P	
MCA51	Distributed Computing and Cloud Computing	ICT	3	--	--	3
MCA52	Computational Intelligence -II	ICT	3	--	--	3
MCA53	Internet of Things	ICT	3	1	--	4
MCAE54	Elective-III MCAE54 A Cyber Security and Forensics MCAE54 B Deep Learning MCAE54 C Customer Relationship Management MCA E54 D Digital Marketing MCAE54 E Web Services	PE	3	1	--	4
MCAL51	Distributed Computing and Cloud Computing Lab	ICT	--	--	2	1
MCA L52	Computational Intelligence-II Lab	ICT	--	--	2	1
MCA L55	Animation and Graphic Design Lab	ICT	--	--	2	1
MCAP51	Mini Project-V	PR	--	--	2	1
MCAOE1	MOOC	SP	40 hrs module with hands on practice			4
Total			12	2	8	22
SEM VI						
Course Code	Course Name	Group	Teaching Scheme (Hrs/week)			Credit
MCASP6.1	INTERNSHIP – Project	SP	--	--	40	20
MCASP6.2	Seminar- Research Paper	SP	--	--	--	02
Total			--	--	40	22



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Evaluation Scheme

SEM V					
Course Code	Course Name	Marks			
		ISE	MSE	ESE	Total
MCA51	Distributed Computing and Cloud Computing	20	20	60	100
MCA52	Computational Intelligence -II	20	20	60	100
MCA 53	Internet of Things	20	20	60	100
MCAE54	Elective-III MCAE54 A Cyber Security and Forensics MCAE54 B Deep Learning MCAE54 C Customer Relationship Management MCA E54 D Digital Marketing MCAE54 E Web Services	20	20	60	100
MCAL51	Distributed Computing and Cloud Computing Lab	40	--	--	40
MCAL52	Computational Intelligence-II Lab	40	--	--	40
MCAL55	Animation and Graphic Design Lab	40	--	--	40
MCAP51	Mini Project V	25	--	25	50
MCAOE1	MOOC	--	--	--	--
Total					570
SEM VI					
Course Code	Course Name	Marks			
		ISE	MSE	ESE	Total
MCASP6 .1	INTERNSHIP – Project	25	25	100	150
MCASP6 .2	Seminar	--	--	50	50
Total					200



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Semester V



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Course Code	Course Name	Teaching Scheme (Hrs/ week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA51	Distributed Computing and Cloud Computing	3	--	--	3	--	--	3
		Examination Scheme						
		ISE		MSE		ESE		
		20		20		60		

Pre-requisite Course Codes	MCA22
	Student will be able to
Course Outcomes	CO1 Apply principles and communication protocols to Distributed Systems
	CO2 Apply clock synchronization and Distributed shared memory
	CO3 Analyze Distributed file system and management
	CO4 Illustrate the fundamentals of Cloud Computing and its security.

Module No.	Module name	Topics	Ref.	Hrs.
1	Introduction to Distributed Computing	Basic concepts of distributed systems, Distributed computing models, Advantages of Distributed systems, Issues in designing distributed systems.	1,2	3
2	Communication in Distributed Systems	Basic concept Inter process communication, Issues in IPC , Remote Procedural Call (RPC) ,RPC model, Remote Method Invocation (RMI)	1,2	6
3	Synchronization in Distributed Systems	Clock Synchronization, Logical Clocks, Election Algorithms, Mutual Exclusion, Distributed Mutual Exclusion-Classification of mutual Exclusion Algorithm Non Token based Algorithms, Token Based Algorithms.	1,2,5	6
4	Distributed shared Memory	Fundamental concepts of DSM, Design and Implementation issues of DSM	1,2	5
5	Resource and Process Management	Task assignment approach, Load balancing approach, load sharing approach, Introduction to process management, process migration, Threads.	1,2	6
6	Distributed File System	File models, File Accessing models, File caching schemes, File sharing semantics, File replication.	1,2	4
7	Cloud Computing fundamentals	Fundamentals of Cloud computing, Key Characteristics of Cloud computing, Cloud Types: Private Cloud, Public cloud,Hybrid,Cloud as a service , Platform as a service, Infrastructure as a service, Software as a service, Introduction & benefit of Virtualization, Implementation Levels of Virtualization, Types,Full and para virtualization	3,4	6
8	Cloud Security and	Privacy and security in cloud, Security	3,4	6



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	Storage	architecture, Data security, Identity and access management, security challenges, Storage basics, Storage as a service providers, aspects of data security AAA model – SSO for Clouds – Authentication management and Authorization management in clouds – Accounting for Resource utilization		
			Total	42

References:

1. Dr. Sunita Mahajan , Seema Shah “Distributed Computing” Oxford University Press,2nd edition,2013
2. Pradeep K. Sinha “Distributed OS”, PHI,2nd edition,2012
3. RajkumarBuyya, Christian Vecchiola," RajkumarBuyya, Christian Vecchiola " Morgan Kaufmann, 2nd edition,2013.
4. Thomas Erl, Zaigham Mahood, Ricardo Puttini" Cloud Computing, Concept, Technology and Architecture ",Prentice Hall,first edition ,2013.
5. ArunKulkarni, Nupur Prasad Giri,Nikhilesh Joshi, BhushanJadhav “Parallel and Distributed systems” (2nd Edition), Wiley publication,2016



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Course Code	Course Name	Teaching Scheme (Hrs/ week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA52	Computational Intelligence-II	3	--	--	3	--	--	3
		Examination Scheme						
		ISE		MSE		ESE		
		20		20		60		

Pre-requisite Course Codes	MCA41	
	Student will be able to	
Course Outcomes	CO1	Recognize the importance of data preparation in Machine Learning
	CO2	Build statistical models for data and Carry out exploratory data analysis
	CO3	Apply machine learning algorithms for predictive modelling
	CO4	Apply machine learning algorithms to solve real world problems
	CO5	Develop awareness of ethical dimensions of the profession of data science

Module No.	Module name	Topics	Ref	Hrs.
1	Introduction	Introduction to data mining: data Design, data sources and clustering, Data quality problems, data preprocessing Introduction to data science: data science process, stages of a data science project	3	7
2	Statistical Inference	Populations and samples, understanding of statistics for data science, statistical modeling, fitting a model, data analysis	4,5	3
3	Introduction - Machine Learning	Machine learning algorithm I: The Learning Problem - Introduction; supervised, unsupervised, and reinforcement learning, Components of the learning problem, Linear regression. Hypothesis testing, Training versus Testing, Gradient Descent, Over fitting & Regularization ,Logistic Regression, K-fold cross validation	4, 5	8
		Machine learning algorithm II : Classification Techniques: Decision tree, Random Forest, Naïve Bayes, SVM Clustering Techniques: K-means, C-means, KNN, Hierarchical	1	9
4	Feature	Feature engineering, Dimension reduction PCA &	1	5



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	Generation and Feature Selection	(Singular Value Decomposition) ,Feature Selection algorithms - Filters; Wrappers, Embedded		
5	Applications of Data Science	Recommendation Systems: Recommendation Engine basics and its working, Types of Recommendation systems, recommendation use cases- Exercise: build your own recommendation system Text Mining: Concept of text mining, text mining algorithms, TF-IDF, Bag of words, sentiment analysis Mining Social-Network graphs Social networks as graphs, Clustering of graphs ,Neighborhood properties in graphs Application of Products	1	7
6	Ethics in Data science	Discussions on privacy, security, ethics, A look back at Data Science, Next generation data scientist	1	3
			Total	42

References:

- 1] Cathy O'Neil and Rachel Schutt, "Doing Data Science, Straight Talk From The Frontline O'Reilly-2013", 1st Edition.
- 2] Yaser S. Abu-Mostafa, Malik Magdon-Ismael, Husan-Tien Lin, "Learning From Data" – 2012, 1st Edition.
- 3] Nina Zumel John Mount, "Practical Data Science with R" -2014, 1st Edition.
- 4] Christopher M. Bishop, "Pattern Recognition and Machine Learning (Information Science and Statistics)", 2006 Springer
- 5] Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective (Adaptive Computation and Machine Learning series)", MIT Press, 1st Edition



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Course Code	Course Name	Teaching Scheme (Hrs/ week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA53	Internet of Things	3	1	--	3	1	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		20	20		60			

Pre-requisite Course Codes	
	Student will be able to
Course Outcomes	CO1 Apply Basic wireless Technologies and security issues in IOT for real world problem analysis
	CO2 Analyze various protocols for IoT.
	CO3 Apply access control in IoT context to real world problems
	CO4 Design applications of IoT For real time scenario

Module No.	Topics	Ref	Hrs
1	Enterprise IoT: From M2M towards the IoT, Subnet of Things, Definitions of Key Terms in IoT. Evolution of Internet of Things - Enabling Technologies IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack - Fog, Edge and Cloud in IoT - Functional blocks of an IoT ecosystem - Sensors, Actuators, Smart Objects and Connecting Smart Objects	2	6
2	IoT Protocol: Standardization, IOT protocol convergence, Message Queue Telemetry Transport (MQTT), Constrained Applications Protocol (CoAP), Advanced Message Queueing Protocol (AMQP), JAVA Message Service API(JMS), Data Distribution Service (DDS), Representational State Transfer (REST), Extensible Message and Presence Protocol (XMPP).	3	8
3	Smart objects: the “things” in IoT, IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4,802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN. Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks Application Transport Methods: Supervisory Control and Data Acquisition	3	8



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4	Design And Development Design Methodology - Embedded computing logic - Microcontroller, System on Chips IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.	4	8
5	Security in IoT Vulnerabilities of IOT, Security requirements, Challenges for a secure Internet of Things, Threat modeling, Threat analysis, Use cases and misuse cases, Activity modeling of threats, Security Architecture, Security Model, Attacks Modeling, Security attacks, Key Elements of IOT Security Security Engineering for IOT Development : Building Security into design and Development, Secure Design, safety and security design, process and agreement, Technology Selection IOT Security Life Cycle: Implementation and integration, IOT security CONOPS document, Network and security integration, Operations and Maintenance, Managing identities, roles and attributes, security monitoring	1	8
6	IoT Strategy Execution: IoT Opportunity Identification, IoT Opportunity Management, Project Initiation, IOT Strategic Research and Innovation Directions, IOT Smart-X Applications, Processes, Data Management, Device level Energy Issues Business Models For The Internet Of Things: Business Models and Business Model Innovation, Value Creation in the Internet of Things, Business Model Scenarios for the Internet of Things. Internet of Things Application : Smart Metering Advanced Metering Infrastructure, e-Health Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards,	2	4
Total			42

References:

1. Daniel minoli, Building the Internet of Things with Ipv6 and Mipv6, WILEY, ISBN No. 978-1-118-47347-4.
2. O'REILLY, "Enterprise IoT" Grayscale Edition
3. Jan Ho" ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Arshdeep Bahga, Vijay Madiseti, —Internet of Things – A hands-on approach, Universities Press, 2015
5. Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocols, Wiley, 2012 (for Unit 2).
6. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.
7. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011. <https://www.arduino.cc/>



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https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet

8. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017

Tutorial on Internet of Things

No.	Title	Hours
1	Introduction: Programming the Arduino, Basic electronic components such as LED, resistors, battery etc.	2
2	Programs based on interfacing with LED's, Switches, Alarm sensors,	2
3	Programs based on interfacing with Display sensors	2
4	Programs based on interfacing with Photo resistor, temperature sensor	2
5	Programs based on interfacing with Passive infrared sensors (PIR), Ultrasonic sensors	2
6	Programs based on interfacing Potentiometer, servo motors	2
7	Interfacing IoT device with Cloud using mobile phone demonstrating MQTT protocol	2
8	Mini projects such as Home automation, Robots, Wearable projects, art projects etc	2



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Course Code	Course Name	Teaching Scheme (Hrs/ week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCAE54A	Cyber Security and Forensic	3	1	--	3	1	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		20		20		60		

Pre-requisite Course Codes	MCAE35A,45A
	Student will be able to
Course Outcomes	CO1 Analyze the issues and challenges faced due to cyber crime.
	CO2 Evaluate various tools and methods used in cybercrime
	CO3 Explain the laws for various cyber crime
	CO4 Analyze forensics of Computer and Handheld Devices for investigation.

Module No.	Module Name	Topics	Ref.	Hrs.
1	Cyber offenses & Cybercrime: Issues and challenges	Cybercrime definition and origins of the world, Classifications of cybercrime, How criminals plan the attacks, Social Engineering, Cyber stalking, Botnets, Attack vector, Cloud computing, Credit Card Frauds in Mobile and Wireless Computing Era, Attacks on Mobile/Cell Phones, Ransomware, Web Treats for Organizations: The Evils and Perils, Best practices with social media marketing tools	1,2	8
2	Tools and Methods Used in Cybercrime	Proxy Servers and Anonymizers, Password Cracking, Key loggers and Spywares, Virus and Worms, Steganography, DoS, DDoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, (Methods, Techniques, Countermeasures), Identity Theft (Types, Techniques, Countermeasures)	1,2	10
3	Cybercrimes and Cyber security	The Legal Perspectives Why do we need Cyber law: The Indian Context, Positive and Weak areas of ITA 2000, Information Security Standard compliances: SOX, GLBA, HIPAA, ISO, FISMA, NERC, PCI-DSS, International Laws: E-Sign, CIPA and COPPA	1,2	8



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4	Understanding Computer Forensics	Historical background of cyber forensic, Need for computer forensic, Cyber forensic and Digital Evidence, Forensic Analysis of E-mail, Digital Forensic life cycle. Chain of custody, network forensic, Approaching a forensic Investigation, Computer Forensic and Steganography, Relevance of OSI 7 layer model to computer forensic, Forensic and social networking sites: The security/ privacy threats	1,8	10
5	Forensics of Hand-held devices	Mobile Phone Forensics, Printer and scanner forensics, Smartphone, Challenges in Forensics of the digital Images and Still Camera, Toolkits for Hand-Held Device, Forensics(EnCase,Forensic card reader,MOBILedit), Organizational Guidelines on Cell Phone Forensics.	1,7	6
			Total	42

References:

- [1] Nina Godbole, SunitBelapure, “*Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*”, Wiley India, New Delhi,
- [2] NinaGodbole “*Information Systems Security*”, Wiley India, New Delhi
- [3] Dan Shoemaker, William Arthur Conklin, Wm Arthur Conklin “*Cybersecurity: The Essential Body of Knowledge*”, Cengage Learning.
- [4] Edward Amoroso “*Cyber Security*”, Silicon Press, First Edition
- [5] Cory Altheide and Harlan Carvey , “*Digital Forensics with open source tools*” , ISBN: 978-1-59749-586 8,Elsevier Publications, April 2011
- [7] EoghanCasey ,”*Digital Evidence and Computer crime 3rd Edition: Forensics Science, Computers and the Internet*”, 2011
- [8] Marjie T. Britz, “*Computer Forensic and Cyber Crime: An Introduction*”, 3rd Edition , 2013

Tutorial on Cyber Security and Forensic

Tutorial No.	Tutorial Topics	No of Hours
1	To demonstrate tools for Active and Passive attack	1
2	To Illustrate Password Sniffing tools	1
3	To study Password Cracking tools	2
4	To Demonstrate Network Vulnerability Assessment tools	2
5	To examine Social Engineering methods	2
6	To show SQL Injection attack	1
7	To study the working of Steganography	1
8	To demonstrate DOS Attack methods	1
9	To study Keylogger Software	1
10	To study Wireless Attack techniques	2
No of Hours		14



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA54B	Deep Learning	3	1	--	3	1	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		20		20		60		

Pre-requisite Course Codes		AI,ML
		Student will be able to
Course Outcomes	CO1	Explain the basics of machine learning.
	CO2	Analyze Deep Feedforward networks for deep learning.
	CO3	Implement Convolutional Networks and Recurrent and Recursive Nets for a given scenario.
	CO4	Analyze Autoencoders and its applications
	CO5	Implement Deep Learning applications using Tensorflow.

Module No.	Topics	Ref	Hrs
1	Machine Learning Basics: Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets ,Estimators, Bias and Variance ,Supervised Learning Algorithms ,Unsupervised Learning Algorithms ,Stochastic Gradient Descent ,Building a Machine Learning Algorithm Challenges Motivating Deep Learning	1,2,3	5
2	Deep Feedforward Networks and Regularization for Deep Learning: Gradient-Based Learning , Hidden Units ,Architecture Design ,Back-Propagation and Other Differentiation Algorithms ,Parameter Norm Penalties ,Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems ,Dataset Augmentation ,Noise,Robustness ,Semi-Supervised Learning ,Multi-Task Learning ,Early Stopping ,Parameter Tying and Parameter Sharing ,Sparse Representations.	1,2,3	6
3	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 ,The Neuroscientific Basis for Convolutional Networks ,Convolutional,Networks and the History of Deep Learning	1,2,3	6
4	Recurrent and Recursive Nets:	1,2,	6



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	Unfolding Computational Graphs ,Recurrent Neural Networks ,Bidirectional RNNs , Encoder-Decoder Sequence-to-Sequence Architectures ,Deep Recurrent Networks ,Recursive Neural Networks ,The Challenge of Long-Term Dependencies,Echo State Networks Leaky Units and Other Strategies for Multiple Time Scales ,The Long Short-Term Memory and Other Gated RNNs	3	
5	Autoencoders: Undercomplete Autoencoders ,Regularized,Autoencoders ,Representational Power, Layer Size and Depth ,Stochastic Encoders and Decoders ,Denoising Autoencoders ,Learning Manifolds with Autoencoders ,Contractive Autoencoders ,Predictive Sparse Decomposition ,Applications of Autoencoders	1,2, 3	6
6	Tuning Specific Deep Network Architectures: Convolutional Neural Networks (CNNs),Recurrent Neural Networks,Restricted Boltzmann Machines,DBNs.	1,2, 3	5
7	Applications of Deep Learning Large-Scale Deep Learning ,Computer Vision ,Speech Recognition Natural Language Processing ,Other Applications	1,2, 3	4
8	Implementing neural networks in TensorFlow: Installing TensorFlow,TensorFlow operations,Placeholders in tensor, session in tensor flow, building multilayer model in tensor flow.	1,2, 3	4
Total			42

References:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
2. Deep learning a practitioner's Approach By Adam Gibson, Josh Patterson.
3. Fundamentals of Deep Learning Nikhil Buduma.

Tutorial on Deep Learning

Sr.no	Tutorial Topics	No of Hours
1	Tutorial on basic machine learning basics.	2
2	Tutorial on feedforward networks.	2
3	Tutorial on Convolutional Neural Networks (CNNs).	2
4	Tutorial on Recurrent and Recursive Nets.	2
5	Tutorial on Tuning deep networks.	2
6	Implementing neural networks using Tensor flow	4
Total		14



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Course Code	Course Name	Teaching Scheme (Hrs/ week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCAE54C	Customer Relationship Management	3	1	--	3	1	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		20	20		60			

Pre-requisite Course Codes	MCA14
	Student will be able to
Course Outcomes	CO1 To compare the strategic nature of CRM and e-CRM
	CO2 To analyze decision making and cognitive experimental process
	CO3 To develop a plan to build CRM
	CO4 To evaluate the integrating phase and quality analysis phase of CRM.

Module No.	Module Name	Topics	Ref.	Hrs.
1	CRM Basics	What is customer, CRM. Customer Life Cycle, B2B CRM, Customer Asset, Goal of CRM, CRM functions	1	8
		CRM architecture	4	
		Scale to measure the depth of relationship, types of relationship, stages of relationship, customer life cycle., CRM process framework	2	
		Knowledge management with focus on CRM, Knowledge management conceptual framework, CRM value chain, proposed customer knowledge management for effective CRM,	2	
		CRM methodology	1	
2	E-Customer Relationship Management	Merging CRM and the internet, customer expectations and importance of E-CRM, Delivering CRM on the internet,	1	5
		Changing pattern of E-CRM, customer value service matrix, existing CRM solutions and future CRM solutions	2	
		Recognizing barriers to internet adoption.	1	
3	Customer Cognitive and Experimental Process	Cognitive learning Perceptual process Customer information Acquisition, Customer Information Processing Model Marketing Communication Process	3	6
4	Planning CRM	CRM Culture, Realistic expectations, CRM strategy – Strategic planning tools, collecting data, assessing findings, creating strategic proposal,	1	4
5	Building CRM	Steps for building infrastructure, gathering business requirements, analyzing and designing components. Understanding data and information, process engineering steps, choose process automation software.	1	8



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		Technology engineering steps, Managing the project – developing the project, controlling the project, finishing the project.		
6	Integrating and Using CRM	Combine process, technology and people Create customer profile, segmenting customers, targeting customer, tools to find right customers. Prepare offers for customer, present the offer Evaluating performance metrics, understand value metrics	1	7
7	Managing Quality and Customer Privacy	Identify data quality issues, planning information quality Customer information management Elements of customer privacy	1	4
			Total	42

References:

- [1] Judith W. Kincaid, “Customer Relationship Management – Getting it Right!”, first edition., 2015, Pearson.
 [2] Jagdish N Sheth, AtulParvatiyar, G. Shainesh, “Customer Relationship management”, Emerging concepts, tools and applications, first edition, 2001, Tata McGrawHill publication.
 [3] Henry Assael, “Consumer Behavior and marketing action”, sixth edition, Cengage Learning.
 [4] H Peeru Mohamed, A Sagadevan, “Customer Relationship Management”, A step by step approach, first edition, 2003, Vikas publication.

List of Tutorials on Customer Relationship Management

Tutorial No.	Title	No. of Hrs	
1	Case study on need for customer relationship and customer support	2	
2	Case study on various goals and basics of CRM and E-CRM	1	
3	Case study on Cognitive learning and experimental process	1	
4	Case study on strategy for CRM	1	
5	Case study on building phase of CRM	2	
	Case study on integrating tools and components in CRM	1	
6	Case study on Quality checking & security for customer data	1	
7	Case study on services marketing: CRM in Services Marketing CRM in Banking CRM in Insurance CRM in Hospital Industry	4	
8	Case study on future of E-CRM	1	
		Total	14

Note: Assign a single project and do tutorial 1-8 based on that.



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Course Code	Course Name	Teaching Scheme (Hrs/ week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCAE54D	Digital Marketing	3	1	--	3	1	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		20	20		60			

Pre-requisite Course Codes	MCA14, MCA 15
	Student will be able to
Course Outcomes	CO1 Explain the foundation for Global Digital Marketing.
	CO2 Apply online branding activities for the assigned product
	CO3 Develop strategies which would help to achieve marketing objectives and achieve Online Reputation Management.
	CO4 Determine emerging trends in Digital marketing.

Module No.	Module Name	Topics	Ref.	Hrs.
1	Introduction to digital marketing	Marketing in the digital age – the present and the future, The technology behind digital marketing. Digital marketing framework, Need a digital marketing strategy, Your business and digital marketing, Digital Consumer, 10 Ps of digital marketing, Website a hub of digital marketing world, E-commerce basics, advantages, disadvantages, People power, market research versus market reality, 3i principles, Digital marketing models	1,2,3	6
2	Search Engine Optimization	SEO : Four stage SEO process, Goals, On-page, off-page optimization, Keyword research, Google webmaster tool, Google Adwords, Google Analytics	1,3	6
3	Online Marketing : Social media, e-mail marketing, mobile marketing	Different forms of social media E-mail marketing process, leads and sales with email marketing, design and content, delivery, discovery, campaign planning, success measurement. Mobile advertising, Mobile gaming, Mobile applications, mobile privacy, mobile data Video Marketing, Statistics on video marketing, Augmented and virtual reality	1,3	15
4	Digital Marketing Strategy	Digital marketing strategy groundwork Defining digital marketing mix Digital marketing strategy roadmap	2	6
5	ORM, Performance Marketing & Web Analytics	Online Reputation Management Performance marketing Web analytics	1	4
6	The future of Digital Marketing	Digital marketing – Global landscape, The Indian view Emerging trends and concepts, Emerging opportunities for digital marketing professionals.	2	5



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			Total	42
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References:

- [1] Damian Ryan, "Understanding Digital Marketing: Marketing strategies for engaging the digital generation", 4th edition, 2017, Kogan Page Limited.
- [2] Puneet Singh Bhatia, "Fundamentals of Digital Marketing", 1st edition, 2017, Pearson Edition.
- [3] Ian Dodson, "The Art of Digital Marketing : The definitive guide to creating strategic targeted and measurable online campaigns", 2016, Wiley.

List of Tutorials on Digital Marketing

Tutorial No.	Title	No. of Hrs
1	Case study :Dulux, Entertainer Social media marketing and optimization YouTube Marketing Facebook marketing LinkedIn Google Plus Twitter	2
2	Case study: Mobile conversions increased year on year. The rise and rise of mobile advertising	2
3	Case study on content marketing and native advertising Info graphics Content Marketing Optimize customer and user experience	2
4	Case study on video marketing , Webinar Marketing Live Streaming	2
5	Case study on Online Reputation Management. Online Marketing Plan.	2
6	Case study: Creating & publishing Blogs	1
7	Adobe analytics – SiteCatalyst, Life without Google	1
8	Develop Strategy for Digital Marketing Discussion on Future development in video marketing.	2
	Total	14



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCAE54E	Web Services	3	1	--	3	1	--	4
		Examination Scheme						
		ISE	MSE	ESE				
		20	20	60				

Pre-requisite Course Codes	MCAL16
	Student will be able to
Course Outcomes	CO1 Conceptualize working of web service architecture
	CO2 Relate messaging framework with SOAP
	CO3 Analyze business policy implemented in web services
	CO4 Integrating concept of security for web services

Module No.	Module Name	Topics	Ref.	Hrs.
1	Web Services: A Realization of SOA	Scope of the Architecture, Transport Services Messaging Services: SOAP, WS-Addressing Service Description: WSDL, Policy Discovery Services: UDDI, MetaData Exchange Quality of Service: WS-Security, Reliable Messaging, Transactions Service Components: Composition of Web Services Composeability	1	4
2	Messaging Framework	SOAP: A Brief History of SOA Architectural Concepts: Defining Some Terms, The SOAP Processing Model, SOAP Roles (Enforcing SOAP Roles—The “must Understand” Attribute, Passing Headers—The “relay” Attribute), SOAP Faults/, Documents and RPC, Message Exchange Patterns, Request/Response MEP, Long-Running Conversational MEP, SOAP Bindings, SOAP and HTTP, SOAP, SOAP Attachments	1	4
3	Web Services Addressing	Addressing Web Services Architectural Concepts: Endpoint References, Comparing Endpoints, Message Information Headers, Binding Endpoint References to SOAP Messages, Request-Reply Pattern in WS-Addressing, Request Message, Reply Message	1	2
4	Describing Metadata : Web Services Description Language (WSDL)	Role of WSDL in WS-*/SOA Architectural Concepts: Extensibility, Support for Multiple Type Systems, Unifying Messaging and RPC, Separation of “What” from “How” and “Where”, Support for Multiple Protocols and Transports, No Ordering, No Semantics	1	6
5	Web Services Policy	Architectural Concepts : Policy Framework(The Policy Container, Policy Operators, ExactlyOne Operator, All Operator, .“Optional” Operator, Policy Vocabulary, Policy Identification and Inclusion, Policy Intersection, Attaching Policies to Web Service	1	4



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6	Discovering Metadata: Universal Description, Discovery, and Integration (UDDI)	Role of UDDI in SOA and the WS Stack: Use of UDDI During Design and Development, Use of UDDI at Runtime, Motivation for UDDI Architectural Concepts UDDI and WSDL: Mapping of WSDL portType Element, Mapping of WSDL Binding Element, Mapping of WSDL Service Element, Mapping of WSDL Port Element, UDDI and WSDL at Development Time, UDDI and WSDL at Runtime UDDI and WS-Policy: Referencing Remote Policy Expressions Directly, Referencing Remote Policy Expressions Indirectly, Querying UDDI Using Policy Expressions	1	4
7	Reliable Interaction	Reliable Messaging, Motivation for Reliable Messaging Reliable Messaging Scenarios: Store and Forward, Batch Window, Failure Recovery, Long-Running Transactions Processing Model: Sequence Lifecycle, Basic Syntax, Sequence Element, Sequence Acknowledgement Element, AckRequested Element, Sequence Fault Element, Delivery Semantics Supported, Policy Assertions, Inactivity Timeout	1	4
8	Motivation for Transactions: Classic Transactions, Business Transactions	Definition of Transaction Architectural Terms: Coordination, Protocols for Atomic Transactions (WS-Atomic Transaction), Protocols for Business Transactions (WS-BusinessActivity) Services and Protocols: WS-Coordination Service, Context, Activation Service, Registration Service, Transaction Protocols, WS-Atomic Transaction, Completion Protocol, Durable Two-Phase Commit Protocol, Volatile Two-Phase Commit Protocol, WS-Business Activity, Business Agreement with Participant Completion, Business Agreement with Coordinator Completion, General Considerations Example: Travel Agent Scenario Using Atomic Transaction(Activation, Application Calls Web Service, Registration, Completion/Coordination), Travel Agent Scenario Using Business Activity(Activation, Application Calls Web Service, Registration, Web Service Completion), Coordination Security A Motivating Example: Travel Agent Web Services Roles of Security in Web Services Motivation for Using WS-Security	1	4
9	End-to-End Security When Intermediaries Are Present	Federating Multiple Security Domains, A Brief History, Architectural Concepts, Processing Model: XML Signature, XML Encryption, Putting the Pieces Together: The Basic Model, Model with Intermediary, Trust Relationships, Interoperability: Basic Security Profile Future Directions, Summary, Advanced Security	1	4
Total			1	42



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References:

- [1] Donald F. Ferguson, Tony Storey, Frank Leymann, Francisco Curbera, Sanjiva Weerawarana "Web Services Platform Architecture: SOAP, WSDL, WS-Policy, WS-Addressing, WS-BPEL, WS-Reliable Messaging, and More" Publisher: Prentice Hall First Edition Release Date: March 2005
- [2] Sam Ruby, O'Reilly "Restful Web Services: Leonard Richardson", First Edition (May 15, 2007)
- [3] Glenn Hostetler, Sandor Hasznos "Web Service and SOA Technologies" Practicing Safe Techs; First Edition (April 22, 2009)
- [4] Raymond Yee Pro "Web 2.0 Mashups: Remixing Data and Web Services" Apress (February 25, 2008)

List of Tutorials on Web Services

Tutorial No.	Title	No. of Hrs
1	Web Services: A Realization of SOA	2
2	Messaging Framework	2
3	Describing Metadata : Web Services Description Language (WSDL)	2
4	Discovering Metadata: Universal Description, Discovery, and Integration	2
5	Motivation for Transactions: Classic Transactions, Business Transactions	2
6	Transactions: Classic Transactions, Business Transactions	2
7	Security concept for Web services	2
Total		14



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCAL51	Distributed Computing and cloud computing Lab	--	--	2	--	--	1	1
		Examination Scheme						
		ISE		MSE		ESE		Total
		40		--		--		40

Pre-requisite Course Codes	MCA22 , MCA31	
	Student will be able to	
Course Outcomes	CO1	Develop RPC and RMI on the given scenario.
	CO2	Analyze Clock Synchronization and Election algorithms
	CO3	Apply Shared memory and load balancing on the given situation
	CO4	Analyze various case studies on cloud computing

Sr.no	Experiment details	Ref	Marks
1	Develop Chat application using socket	1,2,3	5
2	Develop Remote Procedure Call for a given scenerio	1,2,4	5
3	Analyze various Clock synchronization	1,2,4	5
4	Analyze various mutual exclusion algorithm	1,2,4	5
5	Analyze various Election Algorithm.	1,2,3	5
6	Program based on Shared Memory and load balancing	1,2,3	5
7	Study of Virtualization Technologies	5,6	5
8	Study of Cloud technologies	5,6	5
Total			40

References:

1. Java Complete Reference – Herbert Schildt, 5th edition,2002.
2. ArunKulkarni, Nupur Prasad Giri,Nikhilesh Joshi, BhushanJadhav “Parallel and Distributed systems” (2nd Edition), Wiley publication,2016
3. Dr. Sunita Mahajan , Seema Shah “Distributed Computing” Oxford University Press,2nd edition,2013.
4. Distributed OS - Pradeep K. Sinha , PHI.
5. RajkumarBuyya, Christian Vecchiola," RajkumarBuyya, Christian Vecchiola " Morgan Kaufmann, 2nd edition,2013.
6. Thomas Erl, Zaigham Mahood, Ricardo Puttini" Cloud Computing, Concept, Technology and Architecture ",Prentice Hall,first edition ,2013



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Course Code	Course Name	Teaching Scheme (Hrs/ week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCAL52	Computational Intelligence-II Lab	--	--	2	--	--	1	1
		Examination Scheme						
		ISE		MSE		ESE		Total
		40		--		--		40

Pre-requisite Course Codes	MCAL41
	Student will be able to
Course Outcomes	CO1 Apply basic concepts of R.
	CO2 Carry out data manipulation and Exploratory data analysis in R
	CO3 Apply Machine learning algorithms for predictive modelling
	CO4 Build recommendation system in R
	CO5 Build responsive Layout of R applications.

Experiment No	Experiment Details	Ref	Marks
1	Introduction R and R Studio, R data types and objects, reading and writing data, R Packages	1	5
2	Control structures, functions, scoping rules, dates and times, data manipulation in R	1	5
3	Loop functions, debugging tools, Mathematical Functions in R ,Exploratory data analysis in R	1	5
4	Linear and Logistic regression in R/ python	2	5
5	Apply decision tree for real time problems Apply Random Forest for real time problems Apply SVM for real time problems Apply PCA for real time problems	2	5
6	Clustering in R	2	5
7	Building recommendation system in R	2	5
8	Shiny R Applications and R server deployment Also use python anaconda Navigation	2	5
Total			40

References:

- 1] R Programming for Data Science by Roger D. Peng-2016,1st Edition.
- 2] Practical Data Science With R by Nina Zumel John Mount-2014,1st Edition.



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCAL55	Animation and graphic Design Lab	--	--	2	--	--	1	1
		Examination Scheme						
		ISE		MSE		ESE		Total
		40	--	--	--	--	40	

Pre-requisite Course Codes		MCAE35 D
		Student will be able to
Course Outcomes	CO1	Install blender software
	CO2	Demonstrate 3D space and camera setting
	CO3	Implement window types and edit objects
	CO4	Implement Mesh objects using modifiers
	CO5	Develop animation on the given scenario

Module No.	Topics	Ref.	Marks
1	Study and Installation of Blender software	2, 3	5
2	3D cursor and moving in 3D space	2,4	5
3	Camera View setting	2, 1	5
4	To change the window types (File Browser info panel, User preference, Outliner)	3	5
5	Navigate and import objects.	3,2	5
6	Create and edit objects (Moving, Scaling And Rotating Objects)	3	5
7	Mesh objects and Modifiers	3	5
8	To develop animation on given scenario	2,3	5
Total Marks			40

References:

1. Blender Basics ,Classroom tutorial books, 4th Edition, James Chronister,2011.
2. <https://docs.blender.org/manual/en/dev/>
3. The Beginner's guide to Blender, Jonathan Lampel,2015.
4. An introduction to 3D blender, A Book for Beginners, John M Blain.
5. A Blender Tutorial, Building a Loco © Paul Hobbs 2014-15, Version 1.02



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA P51	Mini Project-V	--	--	--	--	--	--	02
		Examination Scheme						
		Phase I (ISE -I)	Phase II (ISE- II)	ESE		Total		
		10	15	25		50		

Pre-requisite Course Codes :	MCA11, MCA31 , MCA32, MCAL36
	Student will be able to
Course Outcomes	CO1 Formulate a real world problem and develop its requirements.
	CO2 Develop a design solution for the identified requirements.
	CO3 Test the prototype against identified requirements.
	CO4 Develop effective communication skills for presentation of project related activities.

Evaluation Scheme

1. Project assessment is done by internal and external examiner. The project carries weightage of 50 marks.
2. The internal assessment is done in two phases. Phase I carry 10 marks, Phase II carries 15 marks. Students will be continuously assessed by the internal examiner in the middle of the semester (phase I) and at the end of the semester (phase II).
3. The external examination is conducted to evaluate the students for 25 marks at the end of the semester.
4. ESE for project shall carry maximum 50 marks in each semester. These 50 marks shall be given by the internal and external examiner together.



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA OE1	MOOC	--	--	--	--	--	--	04
		Examination Scheme						
		40 hrs module with hands on practice						

- In the TYMCA course, students will focus on subjects like programming , DBMS, Security etc to bridge the gap between intermediate and Technology education.
- Student need to select the online courses from specified website from time to time based on the domain of Programming, Networking, Software management, Database, AI, Graphics, UED and Testing, OS and so on.
- List of the courses will be specified by the department before the start of the semester
- Students have to select the course get it sanctioned the course before the commencement of the semester.
- Students need to successfully complete the course with all required criteria of submission (Considering attendance, evaluation, submission of assignment, completion of examination) and submit the course completion certificate to the dept.
- Based on the completion certificate in the speculated time, student will be eligible for the credit of 4 points.



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Semester VI



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EVALUATION OF INTERNSHIP MCASP 6.1

Course Name: Internship Course Code: MCASP6.1	MSE Phase I	ESE Phase II	Total Marks	Total Credits
Institute Supervisor Evaluation	50	50	100	15
Industry Mentor Evaluation	25	25	50	5
	75	75	150	20

Pre-requisite Course Codes : MCA11, MCA31, MCA32, MCAL36	
Course Outcomes	Student will be able to
	CO1 Apply programming concepts to develop software solutions
	CO2 Apply the software engineering principles to solve real life problems using modern tools, used in the organization
	CO3 Apply the software project management processes to carry out the successful completion of project
	CO4 Apply technical communication effectively in the organization
	CO5 Use professional ethics in application development
	CO6 Develop skills for working in the team and for life-long learning

**For Phase 1 and Phase 2: 60 Marks Rubrics Based Evaluation
15 Marks Internship Report Evaluation**

MSE (Phase 1): (First 3-Months Evaluation),

ESE (Phase II): (Next 3-Months Evaluation)

- MSE: Mid Semester Examination
- ESE: End Semester Examination



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA SP 6.2	Internship-Seminar	--	--	--	--	--	02	02
		Examination Scheme						
		Presentation			Paper writing			Total
		25			25			50

Pre-requisite Course Codes : Programming language, DBMS, UML	
Course Outcomes	Student will be able to
	CO1 Apply programming concepts to develop software solutions
	CO2 Apply the software engineering principles to solve real life problems using modern tools, used in the organization
	CO3 Apply the software project management processes to carry out the successful completion of project
	CO4 Apply technical communication effectively in the organization
	CO5 Use professional ethics in application development
	CO6 Develop skills for working in the team and for life-long learning

Guidelines of Internship - Seminar

Step 1: Review Process

1. Student shall submit list of papers and patents selected for review
2. Students shall submit review of literature which include content based on survey, comparison etc

Step 2 : Define problem and state proposed solution

1. Based on the literature review, students shall define problem he identified and wants to work on it.
2. Students should be able to define solution for the problems identified. Propose the Solution

Step 3: Submission of the INTRODUCTION AND BODY of the technical paper

1. Based on the above content students should be able to write introduction and body of technical paper

Step 4: Submission of conclusion

1. Students should submit conclusion on the above analysis

Step 5: Submission of complete paper

1. Students should conclude all the information in IEEE format
2. Students should submit the technical paper

Step 6: Submission of Final Drafted Paper

1. Students should include list of the conferences where the paper can be submitted
2. Final paper should be submitted in hard copy

The evaluation of a student shall be based on his/her performance in ESE. During evaluation faculty must follow the rubrics prepared for respective evaluation. Performance shall be continuously monitored and record of assessment shall be maintained in the prescribed pro-forma by course faculty and monitored by department Head.



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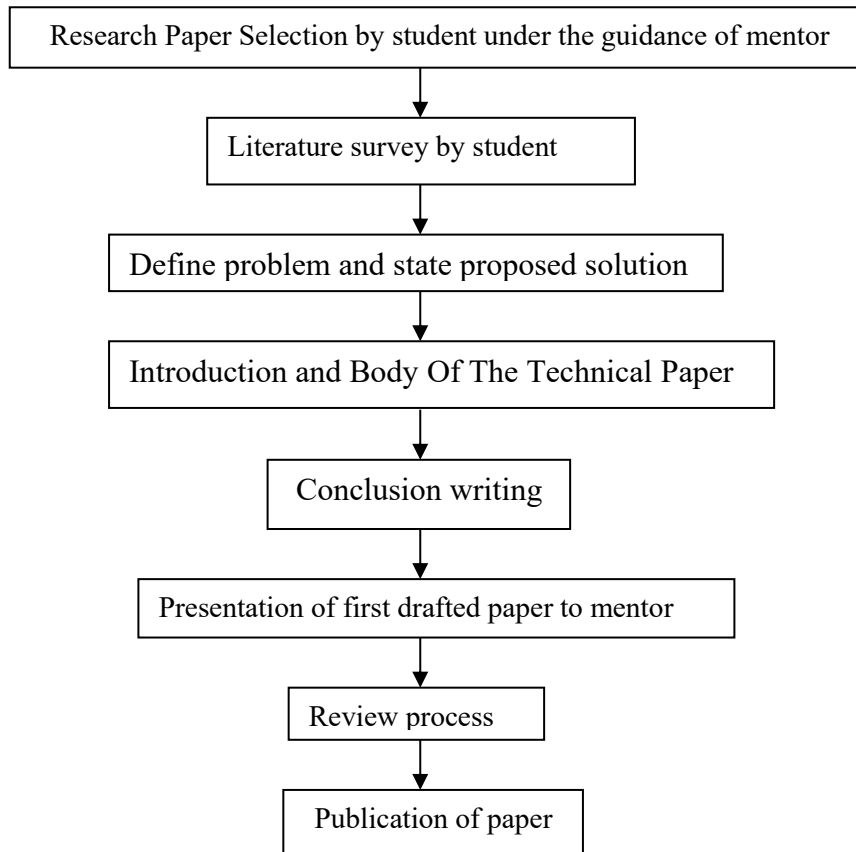


Figure: Process of writing Research Paper