Bharatiya Vidya Bhavan's
Sardar Patel Institute of Technology

(Autonomous Institute Affiliated to University of Mumbai)

Revision:SPIT-3-20

Master Of Computer Application

Third Year MCA

(Sem. V Sem. VI)

Effective from Academic Year 2020-21

Board of Studies Approval: May 8, 2019

Academic Council Approval: May 14, 2019

Raundale

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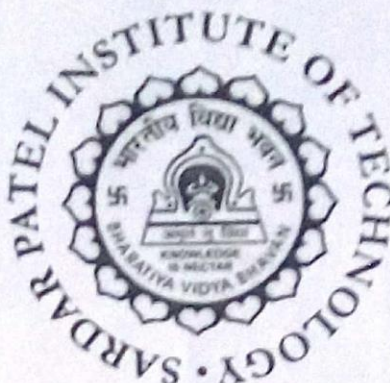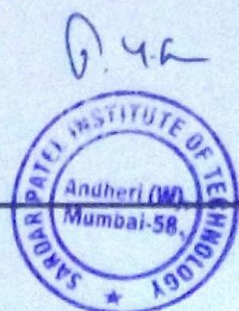Mumbai - 400 058

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
<u>Sardar Patel Institute of Technology</u>

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TYMCA							
2020-21							
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	
MCA 53	Internet of Things	PE	3	1	--	4	
MCAE53	Elective-III MCAE53 A Cyber-Security and Forensics MCAE53 B Deep Learning MCAE53 C Customer Relationship Management MCA E53 D Digital Marketing MCAE53 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 L53	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	12	22	
SEM VI							

Course Code	**Course Name**	**Group**	**Teaching Scheme (Hrs/week)**			**Credits**
MCASP6.1	INTERNSHIP – Project	SP	--	--	40	20
MCASP6.2	Seminar- Research Paper	SP	--	--	--	02
	Total		--	--	40	22

Evaluation Scheme

2020-21

SEM V					
Course Code	**Course Name (Theory)**	**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
MCAE53	Elective-III MCAE53 A Cyber-Security and Forensics MCAE53 B Deep Learning MCAE53 C Customer Relationship Management MCA E53 D Digital Marketing MCAE53 E Web Services	20	20	60	100
MCAL52	Computational Intelligence -II Lab	40	--	--	40
MCAL53	Animation and Graphic Design Lab	40	--	--	40
MCAL51	Distributed Computing and Cloud Computing 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**

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.	1,3	3
2	**Communication**	Basic concept Inter process communication, Issues in IPC , Remote Procedural Call (RPC) ,RPC model, Remote Method Invocation (RMI)	1,3	6
3	**Synchronization**	Clock Synchronization, Logical Clocks, Election Algorithms, Mutual Exclusion, Distributed Mutual Exclusion-Classification of mutual Exclusion Algorithm Non Token based Algorithms, Token Based Algorithms.	1,3	6
4	**Distributed shared Memory**	Fundamental concepts of DSM, Design and Implementation issues of DSM	1,3	5
5	**Resource and Process Management**	Task assignment approach, Load balancing approach, load sharing approach, Introduction to process management, process migration, Threads.	1,3	6
6	**Distributed File System**	File models, File Accessing models, File caching schemes, File sharing semantics, File replication.	1,3,5	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	7,8	6

8	Cloud Security and Storage	Privacy and security in cloud, Security 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	8,9	6
			Total	**42**

Reference Books:
1. Dr. SunitaMahajan, Seema Shah "Distributed Computing" Oxford University Press,2010.
2. Tanenbaum S "Distributed Systems", Pearson Education,2017.
3. Pradeep K. Sinha "Distributed OS", PHI
4. ArunKulkarni, Nupur Prasad Giri,Nikhilesh Joshi, BhushanJadhav "Parallel and Distributed systems" (2nd Edition), Wiley publication.
5. Dr. Kumar Saurabh"Cloud Computing insights into new-era infrastructure", Wiley India
6. Cloud computing, black book, Dreamtech publication, 2014.

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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 no	No. of 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 Generation and Feature Selection**	Feature engineering, Dimension reduction PCA & (Singular Value Decomposition) ,Feature Selection algorithms - Filters; Wrappers, Embedded	1	5
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**

Reference Books
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-Ismail, 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		MCA22
		Student will be able to
Course Outcomes	CO1	Relate the concept ofIoT as Market perspective
	CO2	Design the IoT Reference Architecture and Real World Constraints
	CO3	Compare various IoT Protocols (Datalink, Network, Transport, Session, Service)
	CO4	Build State of the Art – IoT Architecture with Security features

Module No.	Module Name	Topics	Ref.	Hrs.
1	M2M to IoT A Market Perspective	The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT	1	6
2	IoT Technology Fundamentals	Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management	2	8
3	IOT system Architecture	IoT system components: IoT Devices, IoT Gateways, Cloud Access, Cloud Components Cross connectivity across IoT system components:,Device to Gateway –Short Range Wireless(Cell Phone as Gateway, Dedicated Wireless Access Point), Gateway to Cloud- Long Range connectivity(Wired, Cellular, Satellite, WAN), Direct Device to Cloud connectivity, IoT Device Power Constraints, Powered and Unpowered Sensors, Power Harvesting, Energy Storage Technologies	3	10
4	IOT networking	Networking Architectures: Star, Mesh, Tree Networking Protocols: TCP/IP, 6LowPan, RPL, Thread IoT Devices Application Level Protocols: MQTT, CoAP, REST, Proprietary, More (to be added)		6
5	IOT Security	Security Requirements in IoT Architecture - Security in Enabling Technologies - Security Concerns in IoT Applications. Security Architecture in the Internet of Things - Security Requirements in IoT- Attacks Specific to IoT. Symmetric Encryption Standards: Symmetric Encryption (DES, AES 128…), Hashing, Authentication, CCMP Authentication and	3	6

		Encryption protocol, Non Symmetric Encryption Standards, Diffie Hellman (principle, Man in the Middle attack), RSA		
6	Use case examples	AMR (Automatic Meter Reading), Smart City, Smart Home Industrial Control, Smart Social Networks, Big Data Analytics	1,2, 3,4, 5	6
			Total	42

References:

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1 st Edition, VPT, 2014. 2.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
3. Practical Internet of Things Security (Kindle Edition) by Brian Russell, Drew Van Duren
4. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1 st Edition, Academic Press, 2014.
5. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI
6. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer

Tutorial on Internet of Things

Tutorial No.	Tutorial Topics	No of Hours
1	To study Market perspective of IOT	2
2	To study about companies using XaaS as a service	1
3	To compare Amazon, google and Azure services	1
4	To differentiate TCP/IP and 6LowPan	1
5	To study the application of CoAP in real world.	1
6	To study the application of REST in real world.	1
7	To study attacks on IOT system and its prevention	1
8	To solve Symmetric encryption standards	2
9	To solve Non Symmetric encryption standards	2
10	To solve a case study on smart home appliances	2
	Total	14

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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	**T**	**P**	**L**	**T**	**P**	**Total**
MCAE53A	**Cyber Security and Forensic**	3	1	--	3	1	--	4
		Examination Scheme						
		ISE	**MSE**	**ESE**				
		20	20	60				

Pre-requisite Course Codes	MCAE35 A,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 andHandheld 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**

Recommended Books:

[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
MCA53B	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	Understanding the basics of machine learning.
	CO2	Analyzing Deep Feedforward networks for deep learning.
	CO3	Applying Convolutional Networks and Recurrent and Recursive Nets on a given scenario.
	CO4	Analyzing Autoencoders and its applications
	CO5	Evaluating Deep Learning applications using Tensorflow.

Deep Learning Syllabus

Module No.	Unit 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	1,2,3	6

		,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		
4		**Recurrent and Recursive Nets:** 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	1,2,3	6
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.

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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
MCAE53C	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
	CO1	To compare the strategic nature of CRM and e-CRM
Course Outcomes	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.	1	8

		Understanding data and information, process engineering steps, choose process automation software. 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
MCA E53D	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
			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
MCAE53 E	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	42

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Recommended Books:

[1] Donald F. Ferguson, Tony Storey, Frank Leymann, Francisco Curbera, SanjivaWeerawarana"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, SandorHasznos "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	Implement RPC and RMI on the given scenario.
	CO2	Implement Clock Synchronization algorithms
	CO3	Implement Shared memory and load balancing on the given situation
	CO4	Analyze various case studies on cloud computing

Sr.no	Experiment details	Ref	Marks
1	Implement Chat application using socket		
2	Implement Remote Procedure Call	1,2,3	5
3	Implementation of Clock synchronization	1,2,3	5
4	Implementation of mutual exclusion algorithm	1,2,3	5
5	Implementation of Election Algorithm.	1,2,3	5
6	Implementation of Shared Memory	1,2,3	5
7	Study of Virtualization Technologies	5,6	5
8	Study of Cloud technologies	5,6	5
		Total	40

Reference Books:
1. Core Java2 Volume I & II – Horstmann, Cornell and gary, 9th edition,2013.
2. Java Complete Reference – Herbert Schildt, 5th edition,2002.
3. Distributed computing system and concepts – Andrew Tanenbaum, 2nd edition, PHI.
4. Distributed OS - Pradeep K. Sinha , PHI
5. Bernard Golden, "Virtualization for Dummies", Wiley Publication.
6. Dr. Kumar Saurabh, "Cloud computing", Wiley Publication.

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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 no	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

Reference Book

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
MCAL53	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 no	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

Reference books:

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						

1.

Pre-requisite Course Codes :	MCA11, MCA31 , MCA32, MCAL36	
	Student will be able to	
Course Outcomes	**CO1**	Interact user forums to support community.
	CO2	Practice charity more effectively
	CO3	Test the prototype against identified requirements.
	CO4	Analyze with the main components of 3P (presage-process-product) model ofteaching and learning

- 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 dept 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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*MOOC

1.NPTEL

 1.1 Computer architecture
 1.2 Artificial Intelligence Search methods for Problem Solving
1.3 Blockchain architecture design and Use cases
1.4 Embedded system design verification and Test
1.5 Social Networks
1.6 System design for sustainability

2.Coursera

  2.1 Machine learning with Tensorflow
       https://www.coursera.org/specializations/machine-learning-tensorflow-gcp
  2.2 Responsive Website Basics
        https://www.coursera.org/specializations/website-development

3 .Udacity

3.1 Full stack developer [PHP]
https://www.udacity.com/course/full-stack-web-developer-nanodegree--nd004
3.2 IoS Developer
   https://www.udacity.com/course/ios-developer-nanodegree--nd003

Semester VI

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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA SP 6.1	INTERNSHIP – Project	--	--	40	--	--	20	20
		Examination Scheme						
		ISE		MSE		ESE			Total
		Presentation	Oral	Presentation	Oral	Presentation	Oral	Report	
		15	10	15	10	25	25	50	150

Pre-requisite Course Codes : MCA11, MCA31 , MCA32, MCAL36		
	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
Course Outcomes	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:

1. Student need to select a company for internship, or can work under the guidance the internal mentor. If student is not selected to work in industry for internship project, internal mentor need to organize project in the college itself which may be in accordance with Academic rules of institute. Max. 3 students shall be allotted to one internal mentor in case student not getting industry internship.
2. Every student should submit joining letter along with their project proposal within 4 weeks of joining internship in company. Project proposal should include company information, External mentor information, project abstract and tool (tentatively) working.
3. After submission of project proposals, ISE shall be conducted.
4. MSE shall be conducted as per academic time table.
5. Student need to arrange for meeting between internal and external mentor for feedback and improving the industry interaction before ESE.
6. Every student shall make draft of project report and get it accessed by internal mentor. The Project report should contain an Introduction to Project, which should clearly explain the project scope in detail. Also, Data Dictionary, ERDs, File designs and a list of output reports should be included if required as per the project title and scope. The project Work should be of such a nature that it could prove useful or be relevant from the commercial/management angle. Every student should submit duly signed Project Report.
7. ESE shall be conducted after submission of Project Report

The evaluation of a student shall be based on his/her performance in ISE, MSE and ESE. The mode of

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evaluation for ISE and MSE is Orals and Presentation. 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. The marks and weightage is shown in the following Table.

Table: Marks and Weightage of Evaluation

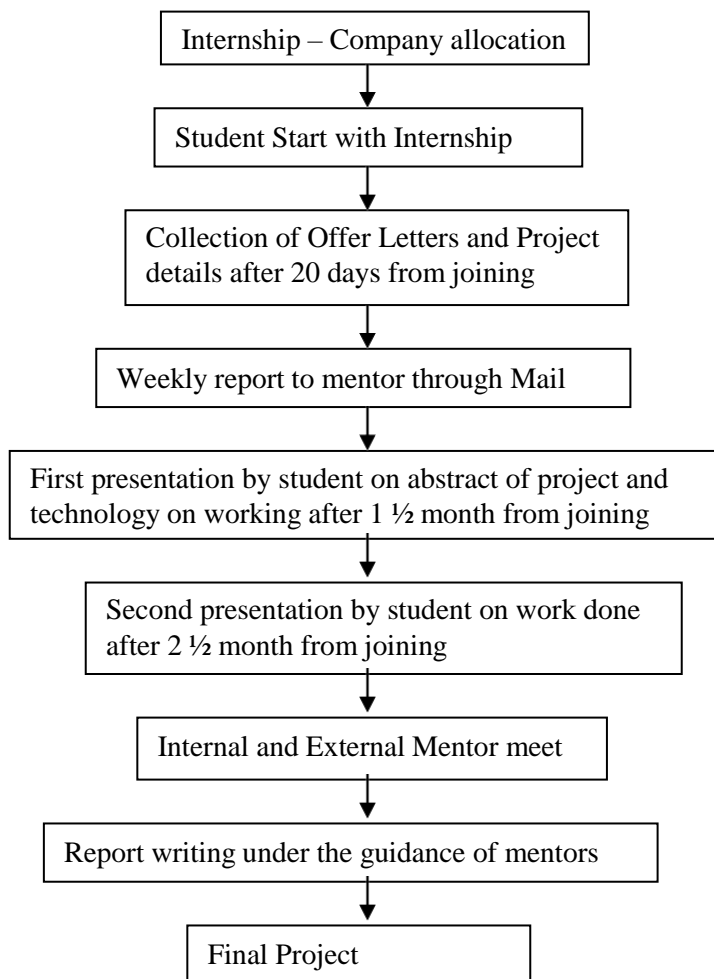| Evaluation	Oral		Presentation		Report	
	Marks	% weightage	Marks	% weightage	Marks	% weightage
ISE	15	100	10	100	--	--
MSE	15	100	10	100	--	--
ESE	25	100	25	100	50	100

Execution of Internship – Project

Internship – Company allocation

↓

Student Start with Internship

↓

Collection of Offer Letters and Project details after 20 days from joining

↓

Weekly report to mentor through Mail

↓

First presentation by student on abstract of project and technology on working after 1 ½ month from joining

↓

Second presentation by student on work done after 2 ½ month from joining

↓

Internal and External Mentor meet

↓

Report writing under the guidance of mentors

↓

Final Project

Figure: Process of Internship

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	Analyze a topic in the area of research
	CO2	Identify problem to carry out research
	CO3	Explore and enhance research potential
	CO4	Compile research content for presentation of literature review
	CO5	Understand structure of research papers

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 INTORDUCTION 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.

Research Paper Selection by student under the guidance of mentor

Literature survey by student

Define problem and state proposed solution

Introduction and Body Of The Technical Paper

Conclusion writing
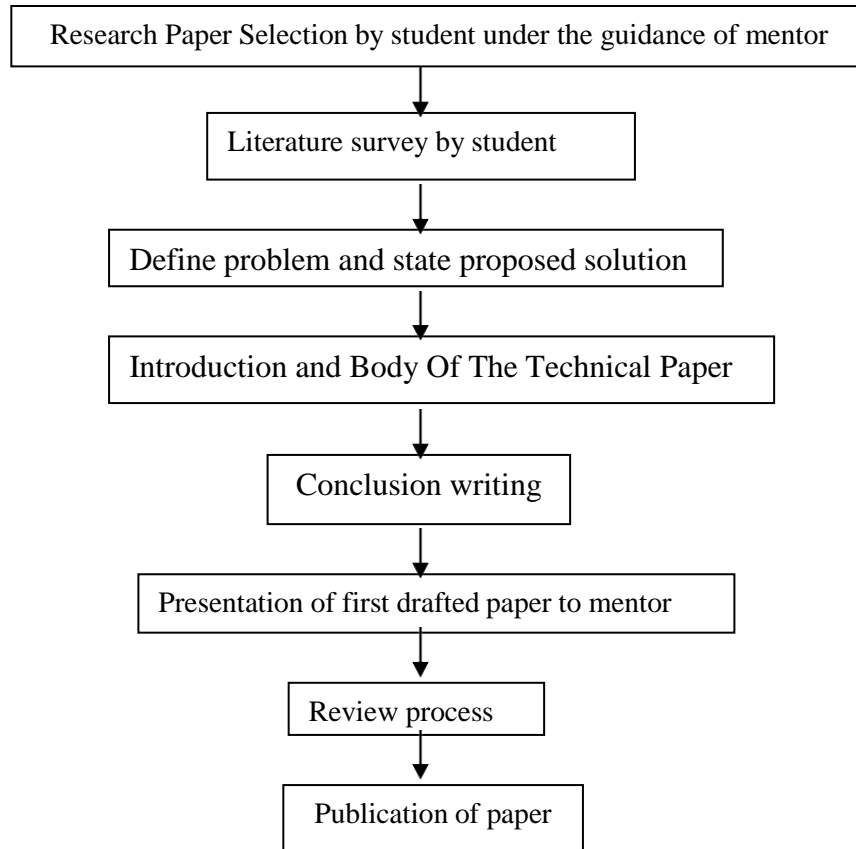
Presentation of first drafted paper to mentor

Review process

Publication of paper

Figure: Process of writing Research Paper