

NEW SCHEME FOR MASTER OF COMPUTER APPLICATIONS (MCA) COURSE
SEMESTER - V of MCA, Applicable from July 2020 onwards

Sr. NO.	SUBJECT NO.	NAME OF THE SUBJECT	THEORY TUTO Hr	TEACHING SCHEME				EXAMINATION SCHEME						T.W. TOTAL MARKS
				PRACT. Hr.	SESSIONAL M. Hr.	THEORY		PRACT. M	H					
						M.	Hr							
1	MCA 311	Software Engineering	4	-		25	2	50	3	-	-	25	100	
2	MCA 312	Network Security	3	1	3	25	2	50	3	50	3	25	150	
3	MCA 312	Web Technologies	4	-	3	25	2	50	3	50	3	25	150	
4	MCA 314	Elective - 2	4	-	3	25	2	50	3	50	3	25	150	
5	MCA 315	Dissertation	-	6	-	25	2	-	-	100	-	25	150	
	TOTAL			15	7	9	125	-	200	-	250	-	125	700

SUBJECTS FOR ELECTIVE - 2

- (i) Image Processing
- (ii) Internet of Things
- (iii) Machine Learning
- (iv) Wireless Communications and Mobile Technologies
- (v) Human Computer Interaction

Course Name: Software Engineering

Course Code: MCA 311

Objectives:

A large percentage of Software projects are termed as failures because they overshoot their planned budget and / or schedule or are of poor quality. Such failed projects then have far reaching economic and other consequences. The main reasons for this failure are poor engineering and poor project management. Hence, there is an urgent need for a systematic, disciplined and quantifiable approach to software development and maintenance. The field of Software engineering which has evolved considerably over the last few decades deals with this approach. Thus, it becomes mandatory for software developers to understand and apply the techniques of software engineering.

Hence, the objective of this course is

- To understand the basic concept and importance of Software Engineering
- To understand the process of Software Engineering
- To understand all the activities required to develop and maintain software.

Prerequisites:

Basic knowledge of Programming, Systems Analysis and Design.

Contents:

1. Software Engineering and Process Models

Nature of Software, Unique nature of WebApps, Software Engineering, Software Engineering Practice and Principles.

Generic Process Model, Process Assessment and Improvement, Prescriptive and Specialized Process Models, Unified Process, Personal and Team Process Model, Process Technology, Product and Process.

Agility, Agility and cost of change, Agile Process.

2. Guiding Principles, Requirements understanding and modeling

Software Engineering Knowledge, Core Principles, Framework Activity Guiding Principles. Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

Requirement modeling Strategies, Flow-Oriented Modeling, Behavioral Model, Patterns of Requirements Modeling, Requirement Modeling of WebApps.

3. Software Design –Concepts, Architecture, Component, User Interface, Web

Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model.

Software Architecture, Architectural Genres, Architectural Styles, Architectural Design. Introduction of Component, Designing class-based Components, Conducting Component level Design, Component level design for WebApps, Designing Traditional Components, Component based Development.

Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evolution.

WebApp Design Quality, Design Goals, Design Pyramid for WebApps, WebApp Interface Design, Aesthetic Design, Content Design, Architecture Design, Navigation Design, Component level Design, Object oriented Hypermedia Design Method.

4. Quality Concepts, Review Techniques and Software Quality Assurance

Introduction of Quality, Software Quality, Software Quality Dilemma, Achieving Software Quality.

Cost Impact of Software Defects, Defect Amplification and Removal, Review Metrics and its Use, Reviews: A Formality Spectrum, Informal Review, Formal Technical Reviews.

Background Issues of SQA, Elements of Software Quality Assurance, SQA Tasks, Goals and Metrics, Formal Approaches to SQA, Statistical Software Quality Assurance, Software Reliability, ISO - 9000 Quality Standards, SQA Plan.

5. Testing Strategy, Testing of Conventional, Object Oriented and Web Applications

A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test for Object Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, Art of Debugging.

Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing, Model Based Testing, Testing for Specialized Environments, Architecture, and Applications, Patterns of Software Testing.

Broadening the View of Testing, Testing OOA and OOD Models, Object oriented Testing Strategies, Object oriented Testing Methods, Testing Methods Applicable at Class Level, Interclass Test-Case Design.

Testing Concepts for WebApps, Overview of Testing Process, Content Testing, User Interface Testing, Component-level Testing, Navigation Testing, Configuration Testing, Security Testing, Performance Testing.

6. Software Configuration Management and Software Metrics

Software Configuration Management, SCM Repository, SCM Process, Configuration Management for WebApps.

Framework for Product Metrics, Metrics for Requirements Model, Metrics for the Design Model, Design Metrics for WebApps, Metrics for Source Code, Metrics for Testing, Metrics for Maintenance.

References:

- 1) Roger Pressman, "Software Engineering – A Practitioner's Approach", 7th Edition, McGraw Hill Higher Education.
- 2) Sommerville, "Software Engineering", Pearson Education.
- 3) W S Jawadekar, "Software Engineering – Principles and Practices", TMH Publication.
- 4) S A Kelar, "Software Engineering – A Concise Study", PHI Publication.

Accomplishments of the student after completing the Course:

- Understand and appreciate the importance of Software Engineering in today's world.
- Understand and perform the various activities required to develop good quality software within time and cost budget.

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Course Name: Network Security

Course Code: MCA 312

Objectives:

After completion of this course student will be able to appreciate

- What security threats and attacks are and what are the counter measures
- Symmetric and asymmetric encryption methods
- Authentication applications, Web, IP and Email security
- Intruders and Firewalls

Prerequisites:

- Fundamentals of Networking
- Number theory
- Basic Mathematics

Contents:

1. Network Security and Symmetric Encryption [20%]

Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, A Model for Internetwork Security, Internet Standards the Internet Society.

Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Stream Ciphers and RC4, Cipher Block Modes of Operation, Location of Encryption Devices, Key Distribution.

2. Public Key Cryptography and Authentication

Approaches to Message Authentication, Secure Hash Functions and HMAC, Public Key Cryptography Principles, Public Key Cryptography Algorithms, Digital Signatures, Key Management.

Kerberos, X.509 Directory Authentication Service, Public Key Infrastructure.

3. Email and IP Security

Pretty Good Privacy (PGP), S/MIME.

Overview of IP Security, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management.

4. Web Security and Intrusion

Web Security Requirements, Secure Sockets Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

Intruders, Intrusion Detection.

5. Passwords and Firewalls

Password Management.

Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation.

References:

- 1) William Stallings, “Network Security Essentials:- Applications and Standards”, 3rd Edition, Pearson Education.
- 2) Behrouz Forouzan, “Cryptography and Network Security”, TMH Publication.
- 3) Nina Godbole, “Information Systems Security”, Wiley Publication.
- 4) William Stallings, “Cryptography and Network Security”, Pearson Education.

Accomplishments of the student after completing the Course:

- Understand and appreciate the importance of Network Security in today’s world.
- Understand and use good Network Security applications and standards in various applications.

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Course Name: Web Technologies

Course Code: MCA 313

Objectives:

The objective of the course is make the students learn the concepts of web technologies and apply it in real life applications.

Prerequisites:

HTML, DHTML and Object-Oriented programming

Contents:

1. Java Script

Overview of Java Script, Primitives, Operations and Expressions, Screen Output and Keyboard Input, Control Statement, Object Creation and modification, Arrays, Functions, Constructors, Pattern Matching using regular expressions

2. AJAX Framework

Introducing Prototype and Scriptaculous, Introducing Quick Gallery, Simplifying Ajax with Prototype, Using Prototype's advanced Ajax features

3. JSP

Overview of JSP Technology, Invoking Java Code with JSP Scripting elements, Controlling the structure of generated servlets: The JSP Page directive, Including files and Applets in JSP Pages, Using JavaBeans Components in JSP Documents, Integrating Servlets and JSP: The MVC Architecture, Simplifying access to Java Code: The JSP 2.0 Expression Language

4. Using JSTL

Tag Libraries: The Basics, JSP Standard Tag Library (JSTL)

5. Struts

The Struts Framework Basics: Understanding struts, Setting up struts, Struts flow of control, Processing requests with action objects, Handling request parameters with form beans, prepopulating and redisplaying input forms, Struts framework – i18n and layout: Using properties files, internationalizing applications, Laying out pages with tiles, Using tiles Definitions, Struts framework – validating input: validating in the Action class, validating in the Form Beans, Using the automatic validation framework

References:

- 1) Ivan Bayross, "Web Enabled Commercial Application Development Using HTML, DHTML, PERL, Java Script", BPB publications, Revised Edition
- 2) Dave Crane, Bear Bibeault and Tom Locke, "Prototype and Scriptaculous in Action", Manning Publication
- 3) Marty Hall and Larry Brown, "Core Servlets and JavaServer Pages Volume - 1", Pearson Education

4) Marty Hall and Larry Brown, “Core Servlets and JavaServer Pages Volume - 2”,
Pearson Education,

Accomplishments of the student after completing the Course:

After completion of this course students will be able to:

- Understand the concepts of web technologies.
- Apply web technologies concepts to develop web applications.

Course Name: Image Processing

Course Code: MCA 314(1)

Objectives:

The objective of this course is to

- Provide an introduction to basic concepts and methodologies for digital image processing, and to develop a foundation that can be used as the basis for further study and research in this field.
- Provide understanding of the different types of image representations, enhancing image characteristics, image filtering, and reducing the effects of noise and blurring in an image.

Prerequisites:

Knowledge of Computer Graphics is desirable.

Contents:

1. Introduction

Image Processing, The origins of Digital Image Processing, Examples of Fields that use Digital Image Processing, Fundamentals Steps in Digital Image Processing, Components of an Image Processing System.

2. Digital Image Fundamentals

Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationship between Pixels, An Introduction to the Mathematical Tools Used in Digital Image Processing

3. Intensity Transformation and Spatial Filtering

Background, Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters

4. Filtering in the Frequency Domain

Background, Preliminary Concepts, Sampling and the Fourier Transform of Sampled Functions, The Discrete Fourier Transform (DFT) of One Variable, Extension to Functions of Two Variables,, Some Properties of the 2-D Discrete Fourier Transform, The Basics of Filtering in the Frequency Domain, Image Smoothing Using Frequency Domain Filters, Image Sharpening Using Frequency Domain Filters.

5. Color Image Processing

Color Fundamentals, Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening.

6. Image Compression

Fundamentals, Some Basic Compression Methods (Huffman Coding, Arithmetic Coding, LZW Coding, Run-Length Coding, Block Transform Coding).

7. Image Segmentation

Fundamentals, Thresholding, Point, Line and Edge Detection.

References :

- 1) Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, 3rd Edition, Pearson Education.
- 2) Rafael C. Gonzalez, Richard E. Woods and Steven L. Eddins, “Digital Image Processing Using MATLAB”, 2nd Edition, Tata McGraw Hill Education
- 3) B. Chanda and D. Dutta Majumder, “Digital Image Processing and Analysis”, PHI Publication.
- 4) Madhuri A. Joshi, “Digital Image Processing – An Algorithmic Approach, PHI Publication.

Accomplishment of the student after completing the course:

At the end of the work student will be able to

- Use histogram processing techniques; introduce fuzzy set theory and its application to Image Processing.
- Deal with frequency domain and data compressing.

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Course Name: Internet of Things

Course Code: MCA 314(2)

Objectives:

The aim of this course is:

- Understand general concepts of Internet of Things (IoT)
- Recognize various devices, sensors and applications
- Apply design concept to IoT solutions
- Analyze various M2M and IoT architectures
- Evaluate design issues in IoT applications
- Create IoT solutions using sensors, actuators and Devices

Pre-requisites:

Computer Networking

Contents:

1. Introduction to IoT

Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication Protocols, IOT enabling technologies, Sensor Networks, Machine-to-Machine Communications

2. IoT & M2M

Difference between IoT and M2M, IOT architecture, Software define Network, . SDN for IoT, Data Handling and Analytics, Cloud Computing, Sensor-Cloud. Fog Computing

3. Interoperability in IoT

Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino. Introduction to Python programming, Introduction to Raspberry. Implementation of IoT with Raspberry Pi

4. IOT Applications

Case studies: Lighting as a service Intelligent Traffic systems, Smart Parking, Smart water management, IOT for smart cities, IOT in Indian Scenario: IOT and Aadhaar IOT for health services. IOT for financial inclusion IOT for rural empowerment

5. Challenges

Challenges in IOT implementation: Big Data Management, Connectivity challenges, Mission critical applications, security and privacy issues

References:

1. Vijay Madiseti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014
2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting everything”, 1st Edition, Apress Publications, 2013
3. Cuno Pfister, Getting Started with the Internet of Things, O’Reilly Media, 2011, ISBN: 978-1-4493-357-1

Accomplishments of the student after completing the Course:

- Understand IOT concepts and IOT Standards
- Understand Components and relevance of IOT System for the future
- Build IOT Applications.
- Apply IOT in smart city environment in Indian Scenario
- Analyze challenges in IOT implementation

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Course Name: Machine Learning

Course Code: MCA 314(3)

Objectives:

Introduce the concept of learning patterns from data and develop a strong theoretical foundation for understanding of state of the art Machine Learning algorithms. To enable students to identify, formulate and solve machine learning problems that arise in practical applications.

Prerequisites:

Undergraduate level course in Linear Algebra

Undergraduate level course in Calculus

Contents:

1. Overview of Machine Learning

Introduction to Machine learning from data, Types of Machine Learning: Supervised, Unsupervised, Reinforcement, concepts of regression, classification, clustering

2. Linear Regression

Scatter diagram, Model representation for single variable, Single variable Cost Function, Least Square line fit, Normal Equations, Gradient Descent method for Linear Regression, Assumptions in linear regression, properties of regression line, Model Performance through R^2 , Multivariable model representation, Multivariable cost function, multiple linear regression, Normal Equations and non-invertibility, Gradient Descent method for multiple linear regression,

3. Logistic Regression and Performance Evaluation Measures of Classification

Issues of using Linear Regression in Classification, Sigmoid function, odds of an event, Logit function, Decision Boundary, Maximum Likelihood function, Linear regression verses Logistic Regression, Cost function, Gradient Descent Method for logistic Regression, Multi-classification, pros and cons of logistic regression, Overfitting, Underfitting, Bias and variance, Regularization, Confusion matrix, Statistical measures to measure binary classification : Recall, sensitivity, specificity, precision, accuracy, ROC and AUC

4. Supervised Learning

Classification problems; decision boundaries; K nearest neighbour methods, Linear classifiers, Bayes' Rule and Naive Bayes Model, SVM - Introduction, Support Vectors & Margin, Optimization Objective, Linear & Non-Linear SVM, Hard Margin & Soft

Margin in, Large Margin Classifiers, Kernels, SVM practical considerations, Ensemble methods for classification and regression: Bagging, Random Forests, Boosting, Decision Tree

5. Unsupervised learning

Cluster Analysis, Classification and Clustering , Definition of Clusters ,Clustering Applications , Distance measures, Proximity Measures for Discrete Variables, Proximity Measures for Mixed Variables, Partitional Clustering, Clustering Criteria, K-Means Algorithm, Fuzzy Clustering , Hierarchical Clustering, Agglomerative Hierarchical Clustering, Divisive Hierarchical Clustering, Cluster Validity, External Criteria, Internal Criteria

Reference Books:

1. “Building Machine Learning Systems with Python”; Richert & Coelho; Packt Publishing Ltd.
2. “Data Science from Scratch”; Joel Grus; O’Reilly Publications
3. “MACHINE LEARNING: An Algorithmic Perspective; Stephen Marsland; CRC Press
4. “Clustering”; Rui Xu & Donald C. Wunsch II; IEEE Press
5. “Machine Learning”; Tom M. Mitchell; McGraw-Hill publications
6. “Machine Learning with SVM and other Kernel methods”; K.P. Soman R.Loganathan
7. “Introduction to Machine Learning”; Ethem Alpaydın; The MIT Press

Accomplishments of the student after completing the course:

After completion of the course, students should be able to:

Develop an appreciation for what is involved in learning models from data

Understand a wide variety of learning algorithms

Understand how to evaluate models generated from data

Understand and develop application involving computer vision and Natural Language Processing

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Course Name: Wireless Communication and Mobile Technology

Course Code: MCA 314(4)

Objectives:

This course is introduction to wireless communication with focus on digital mobile communication system and digital data transfer from computer science point of view. It shows integration of services and applications from fixed networks into networks supporting mobility of end user and wireless access. It emphasizes both on technology and standards of mobile communication and shows merging of classical data transmission technologies and extension of today's Internet applications onto mobile and wireless devices.

Prerequisites:

Knowledge of signals, transmission media, protocols and standards of Internet and networking.

Contents:

1. Introduction

Definition, types, applications and history of wireless communication systems. Wireless Transmission: frequencies for radio transmission, signals, antennas, signal propagation, multiplexing, modulation, spread spectrum, introduction to cellular systems.

2. Medium Access Control

Motivation for specialized MAC: hidden and exposed terminals, near and far terminals., DMA, FDMA, TDMA: Fixed TDM, classical Aloha, slotted Aloha, CSMA, DAMA, PRMA, Reservation TDMA, multiple access with collision avoidance, Polling ISMA, CDMA, comparison of S/F/T/CDMA.

3. Telecommunication systems

GSM: Mobile services, system architecture, radio interface, protocols, localization and calling, handover. Localization management, addressing, mobile QOS, security, new data services, other digital cellular networks (listing).

4. Wireless networks and Wireless LANs

Satellite communication, wireless system operations and standards (cordless, WLL, Wimax, IEEE 802.16 broadband) wireless access standards. Introduction to mobile computing. Infrared, spread spectrum, microwave LANs. Wireless LAN standards: Wi-fi, IEEE 802.11, Bluetooth.

5. Mobile network and transport layer

Mobile IP, Dynamic host configuration protocol, mobile adhoc networks, traditional TCP networks, classical TCP improvements, TCP over 2.5/3G wireless networks.

6. Wireless Application Protocol

Architecture, WAP client, WAP gateway, WAP Application server, WAP internal structure, WTA and PUSH features, wireless datagram protocol, WML and WML script. WAP 2.0

References:

- 1) Jochen Schiller, "Mobile Communications", Pearson Education.
- 2) Theodore S. Rappaport, "Wireless communications, principles and practices" Pearson Education
- 3) Dr. Kamilo Feher, "Wireless communication" (WILEY INDIA EDITION)
- 4) Asoke K Talukder, Roopa R Yavgal, "Mobile Computing", TMH

Accomplishments of the student after completing the course:

At the end of the work student will be able to understand terminologies of wireless communication systems, technical background of wireless transmission media, functioning of mobile phone, technologies in Wireless Networks and Wireless LANs, Mobile Computing, influence of mobility on applications, security or IP networks, higher layers of communication like WAP and current trends in wireless communications and cellular technology

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Course Name: Human Computer Interaction

Course Code: MCA 314(5)

Objectives:

The aim of this course is:

- To provide the basic knowledge related to various levels of interaction, design models, techniques and validations focusing on the different aspects of Human Computer Interaction (HCI)
- To make the students think in design perspective and to evaluate interactive design
- To use the concepts and principles of HCI to analyze and propose solution for real life software applications
- Demonstrate the principles of HCI through the prototype modelling

Pre-requisites:

HTML and Java Script

Contents:

1. Overview of Human Computer Interactions

Usability of Interactive Systems: Usability Goals and Measures, Usability Motivations;

Universal Usability: Introduction, Variations in Physical Abilities and Physical Workplaces, Diverse Cognitive and Perceptual Abilities, Personality Differences, Cultural and International Diversity, Users with Disabilities, Older Adult Users, Child Users, Accommodating Hardware and Software Diversity, Overview of Guidelines, Overview of Principles & Theories

2. The Design Process

Design: Introduction, Organizational Support for Design, Design Process, Design Frameworks, Design Methods, Design Tools, Practices, and Patterns, Social Impact Analysis, Legal Issues ;

Evaluation and the User Experience: Introduction, Expert Reviews & Heuristics, Usability Testing and Laboratories, Survey Instruments, Acceptance Tests, Evaluation during Active Use and Beyond, Controlled Psychologically Oriented Experiments, Design Case Studies

3. Interaction Styles

Direct Manipulation & Immersive Environments: Introduction, Overview of Direct Manipulation, Examples of Direct Manipulation, 2-D and 3-D Interfaces, Teleoperation and Presence, Augmented and Virtual Reality

Fluid Navigation: Introduction, Navigation by Selection, Small Displays, Content Organization, Audio Menus, Form Fill-in and Dialog Boxes

Expressive Human and Command Languages: Introduction, Speech Recognition, Speech Production, Human Language Technology, Traditional Command Languages

4. **Design Issues**

Advancing the User Experience: Introduction, Display Design, View Management, Animation, Webpage Design, Color, Nonanthropomorphic Design, Error Messages
Timely User Experience: Introduction, Models of System Response Time Impacts, Expectations and Attitudes, User Productivity and Variability in SRT, Frustrating Experiences

Documentation and User Support: Introduction, Shaping the Content of the Documentation, Accessing the Documentation, Reading from Displays versus Reading from Paper, Online Tutorials and Animated Demonstrations, Online Communities and Other Avenues for User Support, The Development Process

5. **Search and Visualization**

Information Search: Introduction, Five-Stage Search Framework, Dynamic Queries and Faceted Search, Command Languages and "Natural" Language Queries, Multimedia Document Search and Other Specialized Search, The Social Aspects of Search

Data Visualization: Introduction, Tasks in Data Visualization, Visualization by Data Type, Challenges for Data Visualization

6. **Programming the Interfaces**

Designing wireframe models for websites, Evaluating the websites, designing interfaces for mobile phones, Evaluating the interfaces, Designing voice user interfaces, Designing conversational dialogue based systems, Overview of Gaming Systems

References:

4. Shneiderman, Plaisant, et. al, "*Designing the User Interface - Strategies for Effective Human-Computer Interaction*", Pearson Global Edition
5. Dix A, Finlay J., et. al, "*Human Computer Interaction*", Pearson-Prentice Hall
6. Scott B., Theresa N., "*Designing Web Interfaces*", O'Reilly Media
7. Means G., "*Node for Front-End Developers*", O'Reilly Media
8. Cooper A., Reimann R., "*About Face: The Essentials of Interaction Design*", Wiley
9. Hooper S., Berkman E., "*Designing Mobile Interfaces*", O'Reilly Media
10. Greever T., "*Articulating Design Decisions*", O'Reilly Media

Accomplishments of the student after completing the Course:

- Ability to design effective interfaces for human computer interaction
- Ability to evaluate the user interfaces
- Ability to incorporate the principles of HCI to interfaces with augmented reality, virtual reality, and gaming consoles

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Course Name: Dissertation

Course Code: MCA 315

Objectives:

Dissertation aims to provide a real opportunity to the students to explore a subject of their interest from within or outside the course curriculum. As a part of dissertation, the student can

- Make an initial attempt to do some serious “research”
- Review of ongoing research work published in reputed journals or proceedings of conferences of repute
- Present results of some innovative experiments
- Study and analysis of Advanced Computer Science Topics

Prerequisites: Technical Writing Skills, Knowledge of at least one Word-processing software, Knowledge of Internet.

Philosophy:

A group of students (2-3) shall either choose themselves or shall be assigned experiment/topic of their interest by the instructor / mentor, which will form the basis of their dissertation. The group in consultation with their instructor / mentor shall discuss and formulate a description of the dissertation. This should include:

- Title: A clear indication of the content of the Dissertation.
- Aims & Objectives: An overall statement of the nature of the work and what is intended to be done.
- Methodology: The Identification of the ways by which the above stated objectives are to be achieved.
- Timescale: Listing of the tasks involved in the Dissertation and estimation of the timescale involved for each task so as to ascertain the milestones by which the instructor / mentor can assess the progress.

Guidelines for Report Preparation:

- The report should be in the range of 50-100 pages.
- The contents of the report shall include :
 - ✓ Title Page
 - ✓ Acknowledgements
 - ✓ Table of Contents
 - ✓ Main Text
 - ✓ References

- ✓ Appendices
- The Main Text shall consist of :
 - ✓ Introduction
 - ✓ Literature Survey
 - ✓ Methodology
 - ✓ Results
 - ✓ Discussions
 - ✓ Conclusion
- Paper Size: International standard paper size A4 (297 x 210 mm).
- Typing: On one side only.
- Margins: Top 1.0", Bottom 1.0", Left 1.5", Right 1.0".
- Line Spacing: 1.5.
- Character Spacing: Normal.
- Font: Times New Roman or any other non-fancy font.
- Font Size: 12 for Main Text; 10 for References.
- Page number: Pages should be numbered clearly and consecutively; Numbering should be done uniformly throughout the work.
- Diagrams / Charts: Should be arranged so as to open to the right.
- Larger font size may be used for chapter headings and sub headings; the chapter headings, sub headings and sub sub headings should be clearly distinguishable from each other; to distinguish chapter headings from sub headings and sub sub headings any consistent scheme may be adopted.
- References :
 - ✓ Should contain all the work that is consulted.
 - ✓ Should be arranged alphabetically and numbered consecutively.
 - ✓ Font: Same as the main text.
 - ✓ Line Spacing – single.
 - ✓ Documentation Style – IEEE referencing standards to be followed.

Accomplishments of the student after completing the course:

- Writing the dissertation will enable the student to be innovative and develop research bent of mind and be aware of new advancements in the field of Computer Science and Information Technology.

- Thinking analytically, synthesizing complicated information, writing well, and organizing the time will all serve well regardless of the career the student begins.
- It will prepare the students for serious research work in future.

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NEW SCHEME FOR MASTER OF COMPUTER APPLICATIONS (MCA) COURSE
SEMESTER - VI of MCA, Applicable from December 2020 onwards

Sr. NO.	UBJECT NO.	NAME OF THE SUBJECT	THEORY TUTO Hr	TEACHING SCHEME			EXAMINATION SCHEME						
				PRACT. Hr.	SESSIONAL M. Hr.	THEORY M.	Hr	PRACT. M	H	T.W. TOTAL MARKS			

1	MCA 321	Software Development Project	-	4	36	100	-	-	-	300	-	100	500
	T O T A L			4	36	100	-	-	-	300	-	100	500