MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI
PG - COURSES – AFFILIATED COLLEGES
Course Structure for M.Sc Computer Science
(Choice Based Credit System)
(with effect from the academic year 2017- 2018 onwards)

Sem. (1)	Sub. No. (2)	Subject Status (3)	Subject Title (4)	Contact Hrs./ Week (5)	Credits (6)
III	**15**	**Core - 14**	**Digital Image Processing**	**4**	**4**
	16	**Core - 15**	**Soft Computing**	**4**	**4**
	17	**Core - 16**	**Software Testing**	**4**	**4**
	18	**Core - 17**	**Research Methodology**	**4**	**4**
	19	**Elective - 2**	**Principles of Compiler Design, Big Data Analytics, Mobile Computing**	**4**	**3**
	20	**Core - 18 Practical - 5**	**Image Processing Using MATLAB**	**4**	**2**
	21	**Core - 19**	**Mini Project**	**6+6***	**6**
			Subtotal	30	27
IV	**22**	**Core - 20**	**Major Project**	**30+2***	**16**
			Subtotal	30	16
			Total	120	90

DIGITAL IMAGE PROCESSING

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OBJECTIVES

- To understand the broad base of theoretical concepts of image
- To implement the concepts with the state of art of image processing using MATLAB

UNIT - I MATLAB & IMAGE PROCESSING FUNDAMENTALS

Introduction : Fundamentals - The MATLAB Desktop - Using Mat lab Editor /Debugger-getting help-saving and Retrieving work session data - Digital Image Representation - Image I/O and Display – Classes and Image Types - M-Function Programming. Intensity Transformation and Spatial Filtering : Background - Intensity transformation - histogram Processing and function Plotting - Spatial filtering - Image processing toolbox standard spatial filters. **(12L)**

UNIT - II FILTERING TECHNIQUES

Filtering in Frequency Domain : The 2-D Discrete Fourier transform - Computing and Visualizing the 2-D DFT in MATLAB – Filtering in the Frequency domain - Obtaining frequency domain filters from spatial filters - High pass (sharpening) frequency domain filters. Image Restoration and Reconstruction : A model of the image degradation / restoration process - Noise models - Restoration in the presence of Noise only – Periodic Noise reduction using Frequency Domain Filtering – Modeling the Degradation Function - Direct Inverse Filtering - Wiener filtering. **(14L)**

UNIT - III COLOR IMAGE PROCESSUNG

Color Image Processing : Colour image representation in MATLAB - converting to other color spaces - The basics of color image processing - Color transformation - Spatial Filtering of colour images.Working directly in a RGB vector space Wavelets : Background - The fast wavelet transform -Working with wavelet decomposition structures - The inverse wavelet transform- Wavelets in image processing. **(10L)**

UNIT - IV IMAGE COMPRESSION & MORPHOLOGY

Image Compression : Background - Coding Redundancy - Spatial Redundancy - Irrelevant information- JPEG Compression. Morphological image Processor : Preliminaries - Dialation and Erosion - Combining Dialation and erosion - Labelling connected components – Morphological reconstruction - Gray scale morphology. **(12L)**

UNIT - V SEGMENTATION, REPRESENTATION AND DESCRIPTION

Image Segmentation : Image segmentation - Point, line and edge detection - Line detection using the Hough transform – Thresholding – Region - Based segmentation using the Watershed transform. Representation and Description : Background – Representation - Boundary Descriptors. **(12L)**

(TOTAL : 60L)

OUTCOMES

- Able to understand basic concepts of image processing
- Knows how to use built-in image processing functions in MATLAB
- Able to implement various operations on images

REFERENCES

1. Rafael C.Gonzalez, Richard E.Woods and Steven L.Eddins , "Image Processing Using MATLAB" ,Second edition, Tata McGraw Hill Education Private Limited, 2011.
2.Anil.K.Jain, Fundamentals of Digital Image Processing, Prentice-Hall, 1989.
3.Chanda & Majumdar, Digital Image Processing and Analysis, Prentice Hall ,3rd Edition
4.S.Sridhar, Digital Image Processing,Oxford University Press 2011

SOFT COMPUTING

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OBJECTIVES

- To explore the benefits computing methodologies like neural netwoks, fuzzy logic and genetic algorithms.
- To enable the students to develop hybrid systems for the industrial problems.

UNIT - I NEURAL NETWORKS FUNDAMENTALS

Artificial Neural Network : Basic Concepts of Neural networks - Evolution of Neural networks - Basic Models of Artificial neural network - Terminologies of ANN- McCulloch - Pitts Neuron - Linear separability - Hebb Network - Applications of Neural networks.

Supervised learning Network : Introduction – Perceptron Networks – Adaptive Linear Neuron – Multiple Adaptive Linear Neurons – Back propagation Network. **(11L)**

UNIT – II CATEGORIES OF NEURAL NETWORKS

Associative Memory Networks : Introduction – Training algorithms for pattern association – Auto associative Memory Network – Bidirectional Associative Memory – Hopfield Networks.

Unsupervised Learning networks: Introduction – Fixed Weight Competitive Nets - Kohonen Self-Organizing Maps – Learning Vector Quantization – Adaptive Resonance Theory Network. **(13L)**

UNIT – III BASIC CONCEPTS OF FUZZY SET

Introduction to Classical Sets and Fuzzy Sets : Introduction - Classical sets - Fuzzy Sets. Classical Relation and Fuzzy Relations :- Introduction - Cartesian product of a relation - Classical Relation - Fuzzy Relations. Membership Functions : Introduction - Features of Membership Functions – Fuzzification - Methods of Membership Value Assignments. Defuzzification : Introduction - Lambda-Cuts for Fuzzy Sets - Lambda-Cuts for Fuzzy Relations - Defuzzification Methods. **(11L)**

UNIT - IV FUZZY ARITHMETIC AND DECISION MAKING

Fuzzy Arithmetic and Fuzzy Measures : Introduction - Fuzzy Arithmetic - Extension principles – Fuzzy measures. Fuzzy Rule Base and Approximate Reasoning : Introduction- Truth values and Tables in fuzzy logic - Fuzzy properties - Formation of rules- Decomposition of rules - Aggregation of Fuzzy rules - Fuzzy reasoning - Fuzzy Inference Systems. Fuzzy Decision Making : Individual Decision Making - Multiperson Decision Making - Multiobjective Decision Making - Multiattribute Decision Making. Fuzzy Logic

Control Systems : Introduction - Control System Design - Architecture and Operation of FLC System. **(13L)**

UNIT - V GENETIC ALGORITHMS

Genetic Algorithms : Introduction - Basic Operators and Terminologies in GAs - Traditional Algorithm vs. Genetic Algorithm - Simple GA - General Genetic algorithm - The Schema Theorem - Classification of Genetic Algorithm - Applications of Genetic Algorithm.

Applications of Soft Computing : Introduction - A Fusion approach of Multispectral Images with SAR Image for Flood area Analysis - Optimization of TSP using Genetic Algorithm Approach. **(12L)**

(TOTAL : 60L)

OUTCOMES

- Implement machine learning through neural networks
- Able to write genetic algorithms to solve optimization problem
- Understand fuzzy concepts and develop a fuzzy expert system to derive decisions

REFERENCES

1. S.N Sivanandam and S.N Deepa, “Principles of Soft Computing”, Wiley –India, 2007.

2. S.Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2004.

3. J.S.R.Jang, C.T.Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI,Pearson Education 2004.

4. S.N.Sivanandam, S.N.Deepa, “Introduction to Genetic Algorithms”, Springer, 2007.

5. Timothy J.Ross, “Fuzzy Logic with Engineering Application”, McGraw Hill, 2000.

6. Davis E.Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y., 2003.

SOFTWARE TESTING

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4 0 0 4

OBJECTIVES

- To enable a clear understanding about software tester
- To apply software testing knowledge and engineering concepts to detect errors in the software
- To practice software oriented testing projects
- To prepare software testing techniques and tools for industry standards.

UNIT – I SOFTWARE QUALITY ASSURANCE

Introduction to Software Quality Engineering : What is software quality – Benefits of software quality – Software development life cycle model – Types of defects – Definitions used in software quality engineering - Software Quality Assurance and Quality Control - Software Configuration Management (SCM).

Software Quality Assurance : Benefits of SQA – Role of SQA – SQA people – SQA plan – What is process – Process frame works.

Reviews, Inspections and walkthroughs : Management and Technical reviews - Inspections and walkthroughs – Inspection forms and check lists – Rate of Inspection – Inspection metrics- Estimating total number of defects in the software. **(12L)**

UNIT – II TESTING TECHNIQUES

Introduction to Testing : Guiding Principles of testing – Composition of testing team – Essential skills of a tester – Types of Testing – Evaluating the quality of test cases – Techniques for reducing number of test cases – Requirements for effective testing – Test Oracle – Economics of Software testing – Handling defects – Risk in software testing – Requirements traceability matrix.

White box (Structural) Testing : Introduction to control flow graph – Control flow testing – Basis path testing – Linear Code Sequence And Jump (LCSAJ) coverage or JJ –path coverage – Loop testing – Data flow testing – Slice-based testing – Pitfalls of white box testing – Tools for white box testing.

Integration Testing : Types of Integration testing – Functional Decomposition based Integration – Call graph-based Integration – Path-based Integration – Smoke testing.

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UNIT – III FUNCTIONAL & NON-FUNCTIONAL TESTING

Functional Testing : Logic-based Testing – State Transition Testing – Use Case-based Testing – Syntax Testing – Domain Testing – Petry Net-based testing – Tools used in Functional testing.

Non-functional, Acceptance and Regression Testing : Non-functional Testing – Acceptance Testing - Regression Testing. **(10L)**

UNIT – IV INCORPORATING SPECIALIZED TESTING TECHNIQUES

Testing of OO Software and Agile Testing : Basics of OO system – Overview of UML diagram – OO Testing – Quality Metrics for OO Software – Agile Testing.

Test Management: Activities in Test Management – Evaluation of Test Effectiveness – Release Management – Tools used in Test management.

Cloud Testing : Introduction to Cloud computing – Cloud testing – Testing as a Service(TaaS). **(12L)**

UNIT – V TEST AUTOMATION & QUALITY METRICS

Test Automation : Advantages and disadvantages of test automation – Activities in test Automation - Test Automation Frame work – Tools for Test Automation – Script languages in Test Automation.

Metrics for Software Quality : Categories of Software metrics – Metrics program – Types of Metrics – Some Commonly used Software Metrics.

Tools for Quality Improvement: Basic Quality Control Tool – Check sheet – Cause and effect Diagram – Pareto Diagram – Histogram – Scatter Plot – Run chart – Control Chart – Orthogonal defect Classification. **(12L)**

(TOTAL : 60L)

OUTCOMES

- Get an insight into the process of various software testing techniques
- Able to measure the performance of the using various metrics
- Able to evaluate the system with various testing techniques and strategies

REFERENCES

1) Anirban Basu, “Software Quality Assurance, Testing and Metrics”, PHI, 2015.

2) Sandeep Desai, Abhishek Srivastava, “Software Testing A Practical Approach”, PHI , 2016.

3) Srinivasan Desikan, Gopalaswamy Ramesh, “Software Testing Principles and practices”, Pearson, 2012.

4) Aditya P Mathur, “Foundations of Software Testing”, Pearson, 2011

RESEARCH METHODOLOGY

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OBJECTIVES

- To enable the students to know about the information needs of the research domain
- To introduce the concept of scientific research and the methods of conducting scientific enquiry

UNIT – I INTRODUCTION TO RESEARCH

Research Methodology : Introduction -– Objectives of Research – Types of Research –– Research approaches – Significance of Research – Research Methods versus Methodology – Research and Scientific method – Research process – Criteria of good Research – Problems encountered by Researchers in India. Defining the Research problem : What is a Research problem - Selecting the Problem – Techniques involved in defining a problem. **(13L)**

UNIT – II RESEARCH AND SAMPLE DESIGN

Research design : Meaning of research design – Need for Research Design – Features of Good Design – Important concepts relating to Research design – Different Research designs – Basic Principles of Experimental Designs – Important Experimental designs – Informal Experimental designs – Formal Experimental designs. Design of sample surveys : Introduction - Sample design - Types of sampling designs – Non probability sampling – Probability sampling. **(11L)**

UNIT – III SCALING, DATA COLLECTION

Measurements and scaling: Quantitative and qualitative data – Classifications of measurement scales **–** Goodness of measurement scales –Sources of error in measurement – Scaling – Scale classification bases – Scaling techniques – Comparative Scaling Techniques – Non- Comparative Scaling Techniques.

Data Collection : Collection of Primary Data –– Observation Method – Interview method – Collection of data through Questionnaires – Collection of data through Schedules – Difference between Questionnaire and schedule – Guidelines for constructing Questionnaire/schedule – Some other methods of data collection – Collection of secondary data – Selection of Appropriate method for data collection **(13L)**

UNIT – IV ANOVA

Data Preparation : Data preparation process – Questionnaire checking – Editing – coding – classification – tabulation – Graphical representation – Data cleaning – Data adjusting – Some problems in preparation process – Types of analysis – Statistics in research.

Analysis of variance: The ANOVA technique – One way ANOVA – Two way ANOVA **(12L)**

UNIT – V REPORT WRITING, ALGORITHMIC RESEARCH

Interpretation and Report Writing : Meaning of interpretation –Technique of interpretation – Precaution in Interpretation – Significance of Report Writing – Different Steps in Writing Report – Layout of the Research Report – Types of Reports – Mechanics of Writing a Research Report.

Algorithmic Research : Algorithmic Research Problems – Types of Solution Procedure/ Algorithm – Steps of Development of Algorithm – Comparison of Algorithms - Computer and Researchers. **(11L)**

(TOTAL : 60L)

OUTCOMES

- Get a view of how to choose research problem
- Able to design the research and samples
- Explore the features of data collection and data preparation
- Aware about report writing

REFERENCES

1. C.R.Kothari, “Research Methodology, Methods and Techniques”, Third edition, New Age International Publishers, 2010.
2. R.Panneerselvam, “Research Methodology”, PHI, 2009.
3. D.K.Bhattacharyya, “Research Methodology”, First Edition, EBP, 2003.

1. PRINCIPLES OF COMPILER DESIGN

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OBJECTIVES

- To discover principles and techniques that can be used to construct various phases of compiler.
- To explore knowledge about parsers, optimization technique

UNIT – I LEXICAL ANALYSIS

Introduction to Compiling : Language Processors, The Structure of a Compiler.
Lexical Analysis : The role of the lexical analyzer - Input buffering - Specification of tokens - Recognition of tokens – The Lexical Analyzer Generator Lex - Finite automata - Regular expression to finite automata – Design of Lexical Analyzer Generator - Optimization of DFA - based pattern matchers. **(12L)**

UNIT – II SYNTAX ANALYSIS

Syntax Analysis : The role of the parser - Context-free grammars - Writing a grammar - Top down Parsing - Bottom-up Parsing - LR parsers- Parser Generators. Run time environment : Storage Organization – Static Allocation of space. **(10L)**

UNIT – III INTERMEDIATE CODE GENERATION

Intermediate Code Generation : Variants of Syntax trees – Three Address code – Types and Declarations - Translation of Expressions – Type checking - Control flow - Back patching - Switch Statements - Procedure calls. **(12L)**

UNIT – IV CODE GENERATION

Code Generation : Issues in the design of a code generator - The target language – Address in the Target Code – Basic Block and Flow graphs – Optimization of Basic Blocks - A simple code generator – Peephole Optimization. **(13L)**

UNIT – V OPTIMIZATION TECHNIQUES

Machine Independent Optimizations: Introduction to Optimization Techniques - Introduction to Data Flow analysis – Foundations of data flow analysis – Partial Redundancy Elimination - Loops in flow graph **(13L)**

(TOTAL : 60L)

OUTCOMES

- Able to understand various phases of a compiler
- Explore the features of code generation and optimization techniques
- Able to design a compiler

REFERENCES

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi and Jeffrey D. Ullman, “Compilers- Principles, Techniques,and Tools”, Pearson Education Asia, 2011.

2. Fischer Leblanc, Crafting Compiler, Benjamin Cummings, Menlo Park, 1988.

3. Kennath C.Louden, Compiler Construction Principles and Practice, Vikas publishing House, 2004.

4. Allen I. Holub, Compiler Design in C, Prentice Hall of India, 2001.

BIG DATA ANALYTICS

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OBJECTIVES

- To understand the fundamental concepts of big data analytics
- To explore the knowledge about big data computing and data mining, Data integration and extraction
- To develop state-of-the-art Big Data platform in research, education and industrial applications

UNIT – I INTRODUCTION TO BIG DATA

A new paradigm for big data: Scaling with a traditional database – Desired properties of a Big Data System-The problems with fully incremental architectures-Lambda Architecture-Recent Trends in Technology.

Batch Layer: DATA model for Big DATA - The properties of data- the fact-based model for representing data- Graph schemas.Data Model for Big Data: Why serialization framework? - Apache thrift – Limitations of serialization frameworks. **(13L)**

UNIT – II MINING DATA SET

Data Storage on the batch layer: Storage requirements for the master dataset – Choosing a storage solution for the batch layer – How distributed file systems work – Storing a master dataset with distributed file system – Vertical partitioning – Low-level nature of distributed file systems – Storing the SuperWebAnalytics.com master dataset on a distributed file system. **(11L)**

UNIT – III HADOOP, MAPREDUCE

Data storage on the batch layer : Illustration - Using the Hadoop Distributed File System – Data storage in the batch layer with Pail – Storing the master dataset for SuperWebAnalytics.com.

Batch layer : Motivating examples – Computing on the batch layer – Recomputation algorithms vs. incremental algorithms –Scalability in the batch layer – MapReduce: a paradigm for Big Data computing – Low-level nature of MapReduce-Pipe diagrams: a higher-level way of thinking about batch computation **(12L)**

UNIT – IV SERVING LAYER

Serving layer: Performance metrics for the serving layer- The serving layer solution to the normalization/denormalization problem- Requirements for a serving layer database-

Designing a serving layer for Super WebAnalytics.com – Contrasting with a fully incremental solution.

Serving layer: Illustration: Basics of ElephantDB – Building the serving layer for SuperWebAnalytics.com **(11L)**

UNIT - V SPEED LAYER

Speed Layer Realtime views: Computing realtime views – Storing realtime views – Challenges of incremental computation – Asynchronous versus Synchronous updates – Expiring realtime views. Queuing and stream processing: Illustration: Defining topologies with Apache Storm – Apache Storm clusters and deployment –Guaranteeing message processing – Implementing the SuperWebAnalytics.com unique-over-time speed layer. Lambda Architecture in depth: Defining data systems – batch and serving layers – Speed layer – Query layer. **(13L)**

(TOTAL : 60L)

OUTCOMES

- Able to work with big data platform
- Explore design efficient algorithms for mining data for large volumes
- Able to analyze HADOOP and MapReduce technologies
- Get an insight into the issues in Serving layer and Speed layer

REFERENCES

1. Nathan Marz and James Warren, “Big Data Principles and best practices of scalable real-time data systems”, Manning publications co., Dreamtech Press, Edition 2016.

2. Viktor Mayer-Schonberger and Kenneth Cukier, “Big Data: A Revolution That Will Transform How We Live, Work, and Think”, Houghton Mifflin Harcourt, 2013

3.Zikopoulos, Paul and Chris Eaton, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, TMH, 2011.

4. Glenn J.Myatt, “Making Sense of Data”, John Wiley&Sons, 2007.

MOBILE COMPUTING

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OBJECTIVES

- To understand fundamental concepts of mobile computing
- To impart knowledge about PALM OS & Symbian OS
- To provide a computer, system perspective on the converging areas of wireless networking

UNIT – I WIRELESS COMMUNICATION FUNDAMENTALS, ARCHITECTURE

Introduction : Mobility of bits and bytes – Wireless the beginning – Mobile Computing – Dialogue control – Networks – Middleware and gateways – Applications and services – Developing mobile computing applications.

Mobile Computing Architecture : Architecture of Mobile Computing – Three Tire Architecture.

Mobile Computing Through Telephony : Multiple Access procedure – Satellite Communication System - Mobile Computing Through Telephone – Developing an IVR Application. **(11L)**

UNIT – II GSM, SMS

Emerging Technologies : Introduction – Bluetooth – Radio Frequency Identification(RFID) – Wireless Broadband(WIMAX) – Mobile IP .

Global System for Mobile Communication : Introduction – GSM Architecture –Network Aspects in GSM – Mobility Management – GSM frequency allocation – Personal Communication service – Authentication and Security.

Short Message Service : Mobile Computing over SMS - Short Message Service(SMS) – Value added Services through SMS – Accessing the SMS bearer. **(13L)**

UNIT – III GPRS, WAP

General Packet Radio Service (GPRS) : Introduction – GPRS and Packet data Networking – GPRS Network Architecture - GPRS Network Operations – Data Services in GPRS – Applications for GPRS – Limitations of GPRS.

Wireless Application Protocol : Introduction – WAP – MMS-GPRS applications.

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UNIT – IV WIRELESS LAN, INTELLIGENT NETWORKS

Wireless LAN : Wireless LAN Architecture – Mobility in Wireless LAN – Deploying Wireless LAN – Mobile Adhoc Networks and Sensor Networks – Wireless LAN security.

Intelligent Networks and Interworking : Fundamentals of Call Processing – Intelligence in the

Networks — IN Conceptual Model (INCM) – Softswitch –Technologies and Interfaces for IN.

Client Programming : Mobile Phones – Features of Mobile phones – PDA – Design constraints in Applications for Handheld devices **(13L)**

UNIT – V MOBILE APPLICATION DEVELOPMENT

Programming for the PALM OS : History of PALM OS – PALM OS architecture – Application Development.

Wireless Devices with Symbian OS : Introduction to Symbian OS - Symbian OS Architecture – Security on Symbian OS.

Security Issues in Mobile Computing : Information Security – Security Techniques and Algorithms. **(12L)**

(TOTAL : 60L)

OUTCOMES

- Gain knowledge about various types of wireless communication networks
- Understand the architectures, challenges and solutions of wireless communication network
- Able to develop simple mobile application

REFERENCES

1. Asoke K Talukder , Hasan Ahmed and Roopa R Yavagal, “Mobile Computing : Technology, Applications and Service Creation”, Second Edition , TMH, 2010

2.T.G. Palanivelu, R. Nakkeeran, Wireless and Mobile Communication, PHI Learning Private Limited, 2009

3.Raj Kamal, “Mobile Computing” ,Second Edition, Oxford University Press, 2012

4.Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education, 2007

5. William Stallings, “Wireless Communication and Networks”, Pearson Education Asia, 2002

IMAGE PROCESSING USING MATLAB

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OBJECTIVES

To understand the basic structure of MATLAB and to implement the image processing concepts

PROGRAMS SHOULD INCLUDE BUT NOT LIMITED TO

1. Read and display digital Images.
2. Image Arithmetic Operations
3. Image Logical Operations
4. Geometric transformation of Image
5. Histogram Equalization.
6. Non-linear Filtering.
7. Edge detection using Operators.
8. 2-D DFT and DCT.
9. Filtering in frequency domain.
10. Conversion between color spaces.
11. DWT of images.
12. Segmentation.

Core - 19
MINI PROJECT

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It is mandatory that the student should submit a report based on the software (Mini Project) developed on any one of the below mentioned topics:

- Android Applications
- Image Processing Applications
- Web Applications Using ASP.NET with C#

The internal mark shall be distributed as given below:

Internal Assessment Component	**Marks**
System Study	20
Execution	20
Report	10
Total	50

The external mark shall be distributed as given below:

External Assessment Component	**Marks**
Execution	20
Report	15
Viva-voce	15
Total	50

MAJOR PROJECT

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The objective of the project is to enable the students to work in a project of latest topic / research area / industrial applications. Each student shall have a guide from the Department.

During this semester the students are expected to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. Also during this semester, the students are expected to complete the project and submit a full-fledged report comprising of the complete system developed along with implementation and test results. The departmental committee shall examine the students for 50 marks and the evaluation is based on continuous internal assessment comprising of two reviews.

Internal Assessment Component	**Marks**
I Review on 50% Completion	20
Final Review	20
Report	10
Total	50

A Viva-voce will be conducted by two External Examiners and the marks shall be contributed as per the under mentioned components.

External Assessment Component	**Marks**
Report	15
Presentation	20
Viva-voce	15
Total	50