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 2016- 2017 onwards)
(44th SCAA meeting held on 30.05.2016)

Sem	Sub 'Pr. No.	Subject status	Subject Title	Hrs/ week	Cre - dits	Marks				
						Maximum			Passing minimum	
						Int.	Ext	Tot.	Ext.	Tot
III	15	Core – 9	Research Methodology	4	3	25	75	100	38	50
	16	Core – 10	Digital Image Processing	4	3	25	75	100	38	50
	17	Core – 11	Soft Computing	4	3	25	75	100	38	50
	18	Core - 12	Soft ware Testing	4	3	25	75	100	38	50
	19	Elective – III (Choose any one)	**a.** Principles of Complier Design b. Big Data Analytics c. Mobile Computing	4	4	25	75	100	38	50
	20	Practical –V	Image Processing using MATLAB	5	4	50	50	100	25	50
	21	Practical – VI	Software Development Lab	5	4	50	50	100	25	50
IV	22	Project	Major Project	--	18	50	50	100	25	50

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Research Methodology

Unit – I

Research Methodology : Introduction - Meaning of Research – Objectives of Research – Types of Research – Motivation 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 – Technique involved Defining a problem. Research design : Meaning – Need for Research Design – Features of Good Design – Important concept relating to Research design – Different Research designs – Basic Principles of Experimental Designs.

Unit – II

Sampling Design : Census and sample survey – Implications of a sample design – Steps in sample design - Criteria of selecting a sampling procedure – Characteristics of a good sample design – Different types of sample design – How to select a random sample – Random sample from an infinite Universe – Complex random sampling designs. Measurements and scaling techniques : Measurement in Research – Measurement scales – Sources of error in Measurement – Test and sound Measurements – Technique of developing measurement tools – Scaling, Meaning of scaling – Scale classification bases – Important scaling techniques – Scale Construction techniques.

Unit – III

Chi-Square Test for large samples – Definition of Chi-Square – Limitations of Chi-Square test - Chi-Square test as a test of goodness of fit and as a test of independence – Yate's correction and its applications – Analysis of variance(ANOVA) : Concept – One way ANOVA – ANOVA in test in Latin Square Design

Unit – IV

Data Collection : Methods of Data collection – Collection of Primary Data – Observation Method – Interview method – Collection of data through Questionnaires – Collection of data through Schedules – Some other methods of data collection – Collection of secondary data – Selection of appropriate method for data collection.

Interpretation and Report Writing : Meaning of interpretation – Why 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 – Precautions for Writing Research Reports.

Unit – V

Algorithmic Research : Introduction – Algorithmic Research Problems – Types of Solution Procedure/ Algorithm – Steps of Development of Algorithm – Steps of Algorithmic research – Design of Experiments and Comparison of Algorithms – Meta Heuristics for Combinational Problems. The computer – Its role in Research – The Computer and Computer Technology – The Computer System – Important Characteristics - Computer Applications – Computer and Researchers.

Text Books

1. C.R.Kothari, "Research Methodology Methods and Techniques", Second edition, New Age International Publishers, 2010.
2. R.Panneerselvam, "Research Methodology", PHI, 2009.

References

1. S.P.Gupta, Introduction to Mathematical Statics"
2. D.K.Bhattacharyya, "Research Methodology", First Edition, EBP, 2003.
3. Sancheti and Kapoor, "Business Statics".

Digital Image Processing

Unit - I

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.

Unit - II

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.

Unit - III

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.

Unit - IV

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.

Unit - V

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.

Text Book

1. Rafael C.Gonzalez, Richard E.Woods and Steven L.Eddins , "Image Processing Using MATLAB" ,Second edition, Tata McGraw Hill Education Private Limited, 2011.

References

1.Anil.K.Jain, Fundamentals of Digital Image Processing, Prentice-Hall, 1989.
2.Chanda & Majumdar, Digital Image Processing and Analysis, Prentice Hall ,3rd Edition
3.S.Sridhar, Digital Image Processing,Oxford University Press 2011

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Soft Computing

Unit - I

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 – Radial Basis function Network.

Unit - II

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.

Unit - III

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.

Unit - IV

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 - FLC System models.

Unit - V

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 - Holland Classifier Systems - Genetic Programming - 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.

Text Book

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

References

1. S.Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2004.
2. J.S.R.Jang, C.T.Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI,Pearson Education 2004.
3. S.N.Sivanandam, S.N.Deepa, “Introduction to Genetic Algorithms”, Springer, 2007.
4. Timothy J.Ross, “Fuzzy Logic with Engineering Application”, McGraw Hill, 2000.
5. Davis E.Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y., 2003.

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Software Testing

Unit – I

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.

Unit – II

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.

Unit – III

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.

Unit – IV

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).

Unit – V

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.

Text Book

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

References

1) Sandeep Desai, Abhishek Srivastava, " Software Testing A Practical Approach", PHI , 2016.
2) Srinivasan Desikan, Gopalaswamy Ramesh, "Software Testing Principles and practices", Pearson, 2012.
3) Aditya P Mathur, "Foundations of Software Testing", Pearson, 2011

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Principles of Compiler Design

Unit – I

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.

Unit - II

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.

Unit – III

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.

Unit – IV

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.

Unit – V

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

Text Book

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

References

1. A.V. Aho, Ravi Sethi, J.D. Ullman, Compilers - Principles, Techniques and Tools, Addison-Wesley, 2003.
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.

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Big Data Analytics

Unit - I

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.

Unit - II

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.

Unit - III

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

Batch layer: Illustration: An illustrative example- Common pitfalls of data-processing tools – An introduction to JCascalog – Composition. An example batch layer: Architecture and algorithms: Design of the SuperWebAnalytics.com batch layer – Workflow overview – Ingesting new data – URL normalization – User-identifier normalization – Duplicate pageviews – Computing batch views.

Unit - IV

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

Unit - V

Speed Layer Realtime views: Computing realtime views – Storing realtime views – Challenges of incremental computation – Asynchronous versus Synchronous updates – Expiring realtime views. Realtime views: Illustration: Cassandra's data model – Using Cassandra. Queuing and stream processing: Queuing – Steam processing – Higher-level, one-at-a-time stream processing – SuperWebAnalytics.com speed layer.

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.

Text Book

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.

References

1. Viktor Mayer-Schönberger and Kenneth Cukier, "Big Data: A Revolution That Will Transform How We Live, Work, and Think", Houghton Mifflin Harcourt, 2013

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

3. Glenn J.Myatt, "Making Sense of Data", John Wiley&Sons, 2007.

Mobile Computing

Unit – I

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 – Design Consideration for mobile computing - Making existing applications to mobile enabled.

Mobile Computing Through Telephony : Multiple Access procedure – Satellite Communication System - Mobile Computing Through Telephone – Developing an IVR Application – Voice XML –Telephony Application Program Interface.

Unit – II

Emerging Technologies : Introduction – Bluetooth – Radio Frequency Identification(RFID) – Wireless Broadband(WIMAX) – Mobile IP – Internet Protocol version 6(IPV6).

Global System for Mobile Co mmunication : Introduction – GSM Architecture – GSM Entities – Call Routing in GSM – PLMN interface – GSM addresses and identifiers – 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.

Unit – III

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 – Billing and Charging in GPRS – Enhanced Data rate for GSM Evaluation (EDGE).

Wireless Application Protocol : Introduction – WAP – MMS – GPRS Applications.

CDMA and 3G : Introduction – Spread Spectrum Technology – IS-95 – Wireless Data – Third Generation Networks – Applications of 3G.

Unit – IV

Wireless LAN : Wireless LAN Advantages – IEEE 802.11 Standards – Wireless LAN Architecture – Mobility in Wireless LAN – Deploying Wireless LAN – Mobile Adhoc Networks and Sensor Networks – Wireless LAN security – Wireless Access in Vehicular Environment – Wireless Local Loop – Hiper LAN – WIFI versus 3G.

Intelligent Networks and Interworking : Fundamentals of Call Processing – Intelligence in the Networks – SS#7 Signalling – IN Conceptual Model (INCM) – Softswitch – Programmable Networks – Technologies and Interfaces for IN.

Client Programming : Mobile Phones – Features of Mobile phones – PDA – Design constraints in Applications for Handheld devices – Recent Developments in Client Technology.

Unit – V

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

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 – Security Protocols – Public Key Infrastructure.

Text Book

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

References

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

2.Raj Kamal, "Mobile Computing" ,Second Edition, Oxford University Press, 2012

3.Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2007

4. William Stallings, "Wireless Communication and Networks", Pearson Education Asia, 2002

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Image Processing Using Mat Lab

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.

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Software Development Lab

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	10
Execution	10
Report	5
Total	25

The external mark shall be distributed as given below:

External Assessment Component	Marks
Execution	30
Report	25
Vivi-voce	20
Total	75

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Major Project

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 25 marks and the evaluation is based on continuous internal assessment comprising of two reviews.

Internal Assessment Component	**Marks**
I Review on 50% Completion	10
Final Review	10
Report	5
Total	25

A Vivo-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	30
Presentation	25
Viva-voce	20
Total	75