# SYLLABUS

MANONMANIAM SUNDARANAR UNIVERISTY, TIRUNELVELI-12

**PG - COURSES – AFFILIATED COLLEGES**
**COURSE STRUCTURE FOR**

# MASTER OF COMPUTER APPLICATIONS (MCA)

(Choice Based Credit System)
(With effect from the academic year 2020-21 onwards)

| **Semester-III** | | | | |
|---|---|---|---|---|
| **Part** | **Subject Status** | **Subject Title** | **Subject Code** | **Credit** |
| 3 | Core | Data Analytics using R | BCAM31 | 4 |
| 3 | Core | Digital Image Processing | BCAM32 | 4 |
| 3 | Core | Principles of Compiler Design | BCAM33 | 4 |
| 3 | Core | Research Methodology | BCAM34 | 4 |
| 3 | Elective | Software Project Management | BCAE32 | 3 |
| 3 | Practical | Data Analytics using R Lab | BCAL31 | 2 |
| 3 | Practical | Mini Project | BCAL32 | 6 |

# DATA ANALYTICS USING R

**UNIT – I**

**INTRODUCTION TO DATA SCIENCE**

Introduction: Introduction of Data Science-Getting started with R- Exploratory Data Analysis- Review of probability and probability distributions- Bayes Rule Supervised Learning- Regression Polynomial regression- Local regression- k-nearest neighbors

**UNIT – II**

**UNSUPERVISED LEARNING**

Unsupervised Learning- Kernel density estimation k-means- Naive Bayes- Data and Data Scraping Classification-ranking- logistic regression. Ethics- time series advanced regression- Decision trees- Best practices feature selection.

**UNIT – III**

**BIG DATA FROM DIFFERENT PERSPECTIVES**

Big data from business Perspective: Introduction of big data-Characteristics of big data-Data in the warehouse and data in Hadoop- Importance of Big data- Big data Use cases: Patterns for Big data deployment. Big data from Technology Perspective: History of Hadoop Components of Hadoop-Application Development in Hadoop-Getting your data in Hadoop-other Hadoop Component.

**UNIT – IV**

**INFOSPHERE BIGINSIGHTS**

Infosphere Big Insights: Analytics for Big data at rest-A Hadoop-Ready Enterprise-Quality file system-Compression –Administrative tooling-Security Enterprise Integration –Improved workload scheduling-Adaptive map reduce-Data discovery and visualization-Machine Analytics.

**UNIT – V**

**INFOSPHERE STREAMS**

Infosphere Streams: Analytics for Big data in motion Infosphere Streams Basics working of Infosphere Streams-Stream processing language-Operators-Stream toolkits-Enterprise class.

**REFERENCES**

1. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data Hardcover , EMC Education Services, Wiley Publication, 2015
2. Big Data with HadoopMapReduce: A Classroom Approach 1st Edition by RathinarajaJeyaraj , Ganeshkumar Pugalendhi ,Anand Paul, Apple Academic Press, 2020
3. The Data Science Handbook Hardcover – Illustrated by Field Cady, 2017.

# DIGITAL IMAGE PROCESSING

**UNIT - I**

**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**

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 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 Processing**: Preliminaries - Dilation and Erosion - Combining Dilation and Erosion - Labeling connected components

**UNIT - V**

**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.

**Reference Books:**

1. Rafael C.Gonzalez, Richard E.Woods, Steven L.Eddins, “Digital Image

Processing Using MATLAB", Third Edition, Tata McGraw Hill Private Limited, New Delhi, 2011.
2. Anil.K.Jain, "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.
3. S.Jayaraman, S.Essakirajan&T.Veerakumar, "Digital Image Processing"|, Second Edition, McGraw Hill, 2020.
4. Rafael C.Gonzalez, Richard E. Woods, "Digital Image Processing", Fourth Edition, Pearson Education, 2018.

# PRINCIPLES OF COMPILER DESIGN

**UNIT I**

**Introduction to Compiler**: Language Processors – The Structure of Compiler – The Science of Building a Compiler – Application of Compiler Technology - Programming Language Basics.

**A Simple Syntax** – Directed Translator: Syntax Definition – Syntax Directed Translation – Parsing – A Translator of Simple Expression – Lexical Analysis – Symbol Table – Intermediate Code Generation.

**UNIT II**

Lexical Analysis: The Role of the Lexical Analyzer – Input Buffering – Specification of Tokens– Recognition of Tokens – The Lexical – Analyzer Generator Lex – Finite Automata – From Regular Expression to Automata – Design of a Lexical-Analyzer Generator – Optimization of DFA – Based Pattern Matchers.

**UNIT III**

Syntax Analysis: Introduction – Context-Free Grammars – Writing a Grammar – Top-Down Parsing – Bottom-Up Parsing – Introduction to LR Parsing: Simple LR – More Powerful LR Parsers – Using Ambiguous Grammars – The Parser Generator Yacc

**UNIT IV**

Syntax Directed Translation: Syntax-Directed Definitions – Evaluation Orders for SDD's – Applications of Syntax Directed Translation – Syntax Directed Translation Schemes

**Intermediate-Code Generation**: Variants of Syntax Trees – Three – Address Code – Types and Declarations – Translations of Expressions – Type Checking – Control Flow – Back patching – Switch Statements – Intermediate Code for Procedures

**UNIT V**

**Run-Time Environments**:

Storage Organization – Stack Allocation of Space – Access to Nonlocal Data on the Stack.

**Code Generation**: Issues in the Design of a Code Generator – The Target Language – Address in the Target Code – Basic Blocks and Flow Graph.

**Reference Books:**

1. Alfred V.Aho, Monica S. Lam, Ravi Sethi, Jeffrey D.Ullman, “Compilers – Principles, Techniques and Tools”, Pearson Education Asia, Second Edition, 2014
2. Terence Halsey, Compiler Design Principles, Techniques and Tools, Larsen and Keller Education, 2018
3. Dick Grune, Kees van Reeuwijk, Henri E.BalCeriel J.H Jacobs, Koen

Langendoen : Modern Compiler Design, Second Edition, Springer 2012.
4. Douglas Thain " Introduction to Compilers and Language Design" University of Notre Dame, 2019

# RESEARCH METHODOLOGY

**UNIT I**

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

**UNIT – V**

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.

**Reference Books**:


1. C.R.Kothari, "Research Methodology Methods and Techniques", Second edition, New Age International Publishers, 2020.
2. R.Panneerselvam, "Research Methodology", PHI, 2009.
3. S.C Gupta and V.K Kapoor, "Fundamentals of Mathematical statistics", Sulthan Chand & Sons, Delhi, 2020.
4. Deepak Chawla and NeenaSondhi," Research Methodology: Concepts and Cases",Vikas Publishing House, 2016.
5. David M.Levine, David F Stephen,e al., "Business Statistics", Pearson Publisher, 7th edition,2017.
6. Ranjit Kumar "Research Methodology: A Step-by-step Guide for Beginners", Sage Publications Ltd, 2019.

# SOFTWARE PROJECT MANAGEMENT

**UNIT I**

**PROJECT EVALUATION AND PROJECT PLANNING**

Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

**UNIT II**

**PROJECT LIFE CYCLE AND EFFORT ESTIMATION**

Software process and Process Models – Choice of Process models – Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II – a Parametric Productivity Model.

**UNIT III**

**ACTIVITY PLANNING AND RISK MANAGEMENT**

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.

**UNIT IV**

**PROJECT MANAGEMENT AND CONTROL**

Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.

**UNIT V**

**STAFFING IN SOFTWARE PROJECTS**

Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

**REFERENCES**:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Sixth Edition, Tata McGraw Hill, New Delhi, 2017.
2. Robert K. Wysocki ―Effective Software Project Management – Wiley

Publication, 2019.
3. Walker Royce: ―Software Project Management: A Unified Frame work-Addison-Wesley, 2013.
4. Gopalaswamy Ramesh, ―Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013.

# DATA ANALYTICS USING R LAB

1. R program to create a Sequence of numbers from 20 to 50 and find the Mean of numbers from 20 to 60 and Sum of numbers from 51 to 91.
2. R program to create a Vector which contains 10 random integer values between -50 and +50.
3. R program to get all Prime numbers up to a given number.
4. R program to read the .csv, .xls files and display the contents.
5. R program to use Built-in Mathematical Functions.
6. R program to get the Statistical Summary and Nature of the data of a given data frame.
7. Find the Data Distributions using Box and Scatter Plot using R.
8. Plot the Histogram, Bar Chart and Pie Chart on sample data using R.
9. Plot the Density and the Cumulative Probability Curve for a Normal Distribution with Mean= 2.5 and SD = 1.5 using R.
10. Build the Correlation Matrix using R.
11. Build a Decision Tree Classifier using R.
12. Build a Naïve Bayes Classifier using R.

# Mini Project