
**Deccan Education Society's
FERGUSSON COLLEGE (AUTONOMOUS),
PUNE**

Syllabus

for

M. Sc. (Computer Science) - II

[Pattern 2019]

(M.Sc. Semester-III and Semester-IV)

From Academic Year

2020-21

Deccan Education Society's
Fergusson College (Autonomous), Pune

M.Sc. Computer Science- II (Pattern 2019)

From academic year 2020-21

Particulars	Name of Paper	Paper Code	Title of Paper	No. of Credits
M.Sc. - II Semester III	Theory Core Paper - 1	CSC5301	Soft Computing	4
	Theory Core Paper - 2	CSC5302	Full Stack-II : MEAN stack	4
	Theory Core Paper – 3	CSC5303	Software Project Management	4
	Theory Elective Paper- III	CSC5304	Cloud Computing	4
		CSC5305	Machine Learning	4
		CSC5306	MOOC-III	4
		CSC5307	General Elective – III – Modelling and Simulation	4
	Theory Elective Paper- IV	CSC5308	Computer security and Cyber Forensics	4
		CSC5309	Digital Image Processing	4
		CSC5310	Data Science Using R	4
		CSC5311	MOOC-IV	4
		CSC5312	General Elective – IV – Natural Language Processing	
	Practical Core Paper - 1	CSC5313	Project –III	4
M.Sc. – II Semester IV	Practical Core Paper	CSC5401	Industrial Training	8

M.Sc.-II-Semester III
Subject-Computer Science
Theory Core Paper -1 CSC5301: Soft Computing

[Credits-4]

Course Outcomes

At the end of this course, students will be able to

- CO1** To introduce the ideas of soft computing techniques based on human experience.
CO2 To conceptualize fuzzy logic and its implementation for various real world applications.
CO3 To apply the process of approximate reasoning.
CO4 To understand concept of Neural Network.

Unit	Details	Lectures
I	Introduction to Soft Computing : 1.1 Neural Networks: Definition, Advantages, Applications, Scope. 1.2 Fuzzy logic: Definition, Applications. 1.3 Genetic Algorithms: Definition, Applications.	[5]
II	Fuzzy Sets and Relations : 2.1 Brief Review of Conventional Set Theory, Introduction to Fuzzy Sets, Properties of Fuzzy Sets 2.2 Operations on Fuzzy Sets, Crisp Relation, Fuzzy Relation, Cartesian Product and Composition 2.3 Tolerance and equivalence relation, Fuzzy Tolerance and equivalence relation, 2.4 Value assignments, Other Forms of the Composition.	[8]
III	Membership Functions, Fuzzification and Defuzzification : 3.1 Features of the Membership Function, Various Forms 3.2 Fuzzification, Defuzzification to Crisp Sets, λ -Cuts for Fuzzy Relations, 3.3 Defuzzification to Scalars, Membership value assignment-Intuition, Inference.	[6]
IV	Fuzzy Classification, Logic and Fuzzy Systems : 4.1 Classical Logic, Fuzzy Logic 4.2 Approximate Reasoning, Natural Language 4.3 Linguistic Hedges, Fuzzy (Rule-Based) Systems 4.4 Fuzzy Classification	[3]
V	Fuzzy Arithmetic and the Extension Principle 5.1 Extension Principle, Crisp Functions, Mapping, and Relations 5.2 Functions of Fuzzy Sets – Extension Principle 5.3 Fuzzy Transform (Mapping) 5.4 Fuzzy Arithmetic 5.5 Interval Analysis in Arithmetic 5.6 Approximate Methods of Extension	[8]

VI	<p>Neural Network</p> <p>6.1 Fundamental Concept: Artificial Neural Network, Biological Neural Network,</p> <p>6.2 Comparison Between Biological Neuron and Artificial Neuron (Brain vs. Computer),</p> <p>6.3 Advantages of Neural Networks,</p> <p>6.4 Application Scope of Neural Networks.</p> <p>6.5 Artificial Neurons, Neural Networks and Architectures: Neuron Abstraction, Neuron Signal Functions,</p> <p>6.6 Mathematical Preliminaries, Architectures: Feed forward and Feedback, Salient Properties of Neural Networks</p> <p>6.7 Geometry of Binary Threshold Neurons and Their Networks: Pattern Recognition and Data Classification, Convex Sets,</p> <p>6.8 Convex Hulls and Linear Separability, Space of Boolean Functions, Binary Neurons are Pattern Dichotomizers, Non-linearly Separable Problems</p> <p>6.9 Capacity of a Simple Threshold Logic Neuron, Multilayer Networks.</p> <p>6.10 Learning and Memory: An Introduction, Long Term Memory, The Behavioural Approach to Learning, The Molecular Problem of Memory, Learning Algorithms, Error Correction and Gradient Descent Rules, Learning Objective for TLNs, Pattern Space and Weight Space.</p> <p>6.11 Linear Separability, Hebb Network, Perceptron Network, α-Least Mean Square learning</p>	[15]
VII	<p>Genetic Algorithms</p> <p>7.1 A Gentle Introduction to Genetic Algorithms: What are Genetic Algorithm?</p> <p>7.2 Robustness of traditional Optimization and Search Methods,</p> <p>7.3 The Goals of Optimization, How are Genetic Algorithms Different from Traditional Methods</p> <p>7.4 A simple Genetic Algorithm.</p>	[3]

Books:

1. Deepa & Shivanandan , “Introduction to Soft Computing”, Wiley Publication, 2011
2. Timothy Ross , “ Fuzzy Logic With Engineering Applications”, 3rd Edition, Wiley Publication, 2010
3. Satish Kumar , “Neural Networks”, Tata McGraw Hill, 2004
4. David E.Goldberg, “Genetic Algorithms in Search Optimization and Machine Learning”, Pearson Education, 1989

Web References:

1. https://www.tutorialspoint.com/artificial_intelligence
2. <https://onlinelibrary.wiley.com>
3. <http://neuralnetworksanddeeplearning.com>
4. http://www.myreaders.info/html/soft_computing.html

M.Sc.-II-Semester III**Subject-Computer Science****Theory Core Paper -2 CSC5302: Full Stack II: MEAN Stack****[Credits-4]****Course Outcomes**

At the end of this course, students will be able to

- CO1** Develop the skills to build accessible, usable and attractive User Interfaces for your web applications.
- CO2** To make the user interaction as very simple and most efficient.

Unit	Details	Lectures
I	MONGODB 1.1 Introduction 1.2 MongoDB Advantages 1.3 Installation (mlab – mongoose connection) 1.4 Data modelling 1.5 Creating Schemas with Mongoose 1.6 Create Database, Drop Database, CRUD Operations 1.7 Limit Records 1.8 Sort Records 1.9 Aggregation, Data Models, Change Streams, Replication, Storage	[12]
II	EXPRESS JS 2.1 Introduction 2.2 Installation of Node package manager (npm) 2.3 Express Generator, Static files 2.4 Routing, HTTP Methods 2.5 Writing Middleware, Using Middleware, Using template engines 2.6 Error handling 2.7 Cookies, Session , Directory Structure	[12]
III	ANGULAR JS 3.1 What is AngularJS? 3.2 What is Single Page Application? 3.3 Features, Advantages of AngularJS 3.4 MVC and MVVM structure 3.5 Services, Controllers, Directives 3.6 Built-in Directives 3.7 Template 3.8 Routing (with server configurations) 3.9 Digest Cycle (Watcher in AngularJS)	[10]
IV	NODEJS 4.1 Introduction 4.2 Modules 4.3 HTTP Module 4.4 File System 4.5 URL Module 4.6 Uploading Files	[14]

	4.7 Event Loop 4.8 Event Emitter 4.9 Callback's Concept, Buffers, Streams, Nodejs Email, Packaging	
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Books:

1. Simon Holmes, "Getting MEAN with Mongo, Express, Angular, and Node", Second Edition, ISBN 9781617294754, 2019
2. Colin J Ihrig, Adam Bretz,, " Full Stack JavaScript Development With MEAN: MongoDB, Express, AngularJS, and Node.JS", ISBN 0992461251, 2015
3. Amos Q. Haviv, " MEAN Web Development", ISBN 978-1-78398-328-5, 2014

Web References:

1. <https://www.tutorialspoint.com/meanjs/index.htm>
2. <https://www.w3schools.com/nodejs/>
3. <https://angular.io/start>
4. <https://www.javatpoint.com/mongodb-tutorial>

M.Sc. - II Semester III**Subject: Computer Science****Theory Core Paper -3 CSC5303: Software Project Management****[Credits-4]****Course Outcomes**

At the end of this course, students will be able to

- CO1** Learn to apply the project management skills that are required to ensure successful medium and large-scale software projects.
- CO2** Learn to select and apply project management techniques for process modelling, planning, estimation, process metrics and risk management.
- CO3** Learn process of software project management, cost estimation, use of project management tools.
- CO4** Learn the importance of time management for the successful project completion.

Unit	Details	Lectures
I	Introduction to Project Management 1.1 What is Project? 1.2 What is Project management? 1.3 Project phases and project life cycle 1.4 Organizational structure 1.5 Qualities of Project Manager.	[5]
II	Project Management Components 2.1 Project Integration Management-Project plan development and execution 2.2 Change controls 2.3 Configuration management.	[6]
III	Scope Management 3.1 Strategic planning 3.2 Scope planning, 3.3 Scope Definition 3.4 Scope Verification 3.5 Scope Control.	[4]
IV	Time management 4.1 Activity planning 4.2 Schedule development 4.3 Schedule control 4.4 Case study.	[4]
V	Cost Management 5.1 Cost estimation 5.2 Cost Control 5.3 Case study.	[4]
VI	Quality Management 6.1 Quality planning 6.2 Quality assurance.	[2]
VII	Human Resource Management 7.1 Organizational planning 7.2 Staff acquisition	[2]
VIII	Communication Management 8.1 Information distribution	[2]

	8.2 Reporting.	
IX	Risk Management 9.1 Risk identification 9.2 Risk Quantification 9.3 Risk Control	[3]
X	Procurement Management 10.1 Solicitation 10.2 Contract administration	[2]
XI	Software Metrics 11.1 The scope of software metrics 11.2 Software metrics data collection 11.3 Analyzing software data 11.4 Measuring size 11.5 Structure 11.6 External attributes.	[6]
XII	Planning a measurement program 12.1 What is metrics plan: Developing goals, questions, and metrics 12.2 Where and When: Mapping measures to activities. 12.3 How: Measurement tools. 12.4 Who: Measurers, analyst, tools revision plans.	[5]
XIII	Quality Standards 13.1 CMM 13.2 PSP/TSP	[3]

Books:

1. Kathy Schwalbe, Information Technology Project Management, 2008
2. Norman Fenton, Shari Lawrence Pfleeger, Software Metrics A rigorous and practical approach, 1998
3. Roger Pressman, Software Engineering (6th Edition), 2009

M.Sc. - II Semester III
Subject: Computer Science
Elective - III CSC5304: Cloud Computing

[Credits-4]

Course Outcomes

At the end of this course, students will be able to

- CO1** Learn cloud computing types and models.
- CO2** Get knowledge of cloud OS and architectures.
- CO3** Understand virtualization and security concept
- CO4** Learn cloud computing techniques, and architectures.

Unit	Details	Lectures
I	Introduction to Cloud Computing 1.1 Cloud Computing definition, 1.2 Cloud service Models and Types 1.3 Benefits and limitations of Cloud 1.4 Cloud computing vs. Cluster computing vs. Grid computing 1.5 Cloud Computing and SOA	[8]
II	Virtualization 2.1 Virtualization Basics 2.2 Benefits of Virtualization 2.3 Understanding Hypervisors	[6]
III	Infrastructure as a Service (IaaS) 3.1 Introduction to IaaS 3.2 Introduction to virtualization 3.3 Different approaches to virtualization 3.4 Data storage in cloud computing 3.5 Examples of clouds	[8]
IV	Platform as a Service (PaaS) 4.1 Evolution of computing paradigms and related components 4.2 Introduction to PaaS-What is PaaS, 4.3 Service Oriented Architecture (SOA)	[7]
V	Software as a Service(SaaS) 5.1 Introduction to SaaS 5.2 Web services 5.3 Case Study on SaaS	[7]
VI	Cloud Security 6.1 Cloud Security Fundamentals 6.2 Privacy and Security in Cloud 6.3 Cloud Security Architecture 6.4 Identity Management and Access control 6.5 Cloud Computing security challenges	[8]
VII	Issues in Cloud Computing 7.1 Issues in Inter cloud computing 7.2 Quality of services in cloud Computing 7.3 Data Migration in Cloud 7.4 Streaming in Cloud	[4]

Books:

1. Dr. Kumar Saurabh, "Cloud Computing", Wiley Publication, 2012
2. Gautam Shroff, Enterprise Cloud Computing, Cambridge publication, 2010
3. Ronald Krutz and Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley-India, 2010
4. Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper, Cloud Computing for Dummies, Wiley India Edition, 2010

Web References:

1. <https://aws.amazon.com/what-is-cloud-computing/>
2. https://www.tutorialspoint.com/cloud_computing/index.htm

1.

M.Sc.-II Semester III
Subject: Computer Science
Elective – III CSC5305: Machine Learning

[Credits-4]

Course Outcomes

At the end of this course, students will be able to

- CO1** To model the learning primitives.
CO2 To build the learning model.
CO3 To tackle real world problems in the domain of Data Mining, Information Retrieval, Computer vision, Linguistics and Bioinformatics.

Unit	Details	Lectures
I	Introduction to Machine Learning 1.1 Why Machine learning, Examples of Machine Learning Problems 1.2 Structure of Learning, Learning versus Designing, Training versus Testing 1.3 Characteristics of Machine learning tasks, Predictive and descriptive tasks 1.4 Machine learning Models: Geometric Models, Logical Models, Probabilistic Models. 1.5 Features: Feature types, Feature Construction and Transformation, Feature Selection.	[10]
II	Classification and Regression 2.1 Classification: Binary Classification- Assessing Classification performance 2.2 Class probability Estimation, Assessing class probability Estimates, Multiclass Classification. 2.3 Regression: Assessing performance of Regression- Error measures, Overfitting- Catalysts for Overfitting, Case study of Polynomial Regression. 2.4 Theory of Generalization: Effective number of hypothesis, 2.5 Bounding the Growth function 2.6 VC Dimensions, Regularization theory.	[12]
III	Linear Models 3.1 Least Squares method, Multivariate Linear Regression, Regularized Regression 3.2 Using Least Square regression for Classification. Perceptron 3.3 Support Vector Machines, Soft Margin SVM 3.4 Obtaining probabilities from Linear classifiers 3.5 Kernel methods for non-Linearity.	[8]
IV	Logic Based and Algebraic Models 4.1 Distance Based Models: Neighbours and Examples, Nearest Neighbours Classification 4.2 Distance based clustering-K means Algorithm, Hierarchical clustering	[10]

	4.3 Rule Based Models: Rule learning for subgroup discovery, Association rule mining. 4.4 Tree Based Models: Decision Trees, Ranking and Probability estimation Trees, Regression trees, Clustering Trees.	
V	Probabilistic Models 5.1 Normal Distribution and Its Geometric Interpretations, Naïve Bayes Classifier 5.2 Discriminative learning with Maximum likelihood 5.3 Probabilistic Models with Hidden variables: Estimation-Maximization Methods 5.4 Gaussian Mixtures, and Compression based Models.	[5]
VI	Trends in Machine Learning 6.1 Model and Symbols- Bagging and Boosting 6.2 Multitask learning 6.3 Online learning and Sequence Prediction 6.4 Data Streams and Active Learning 6.5 Deep Learning, Reinforcement Learning.	[3]

Books:

1. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer 1st Edition-2013.
2. Ethem Alpaydin, "Introduction to Machine Learning", PHI 2nd Edition-2013.
3. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", Cambridge University Press, Edition 2012.
4. Hastie, Tibshirani, Friedman, "Introduction to Statistical Machine Learning with Applications in R", Springer, 2nd Edition-2012.
5. Parag Kulkarni, "Reinforcement and Systematic Machine Learning for Decision Making", WileyIEEE Press, Edition July 2012.

Web References:

1. <http://alex.smola.org/drafts/thebook.pdf>
2. <http://robotics.stanford.edu/~nilsson/MLBOOK.pdf>
3. <http://research.microsoft.com/en-us/um/people/cmbishop/prml/>
4. <http://mitpress.mit.edu/books/introduction-machine-learning>.

M.Sc. - II Semester III**Subject: Computer Science****Elective- IV CSC5308: Cryptography and Cyber Forensic****[Credits-4]****Course Outcomes**

At the end of this course, students will be able to

- CO1** To get sound understanding of Info-Sys-Security, Net-Security, Cryptography.
CO2 To practically implement the concepts related to applied cryptography and its algorithms.
CO3 To understand and implement different user authentication mechanisms
CO4 To apply fundamental techniques of computer forensic

Unit	Details	Lectures
I	Security in Computing 1.1 Overview of Program Security 1.2 Operating system security 1.3 Database security 1.4 Device Security (IOT , mobile security)	[4]
II	Symmetric Key Cryptography 2.1 Review of cryptography algorithm 2.2 Algorithm types and modes 2.3 Diffie Hellman key exchange algorithm 2.4 DES (Data Encryption Standard) 2.5 IDEA (International Data Encryption Algorithm) 2.6 RC5, Blowfish, AES (Advanced Encryption Standard)	[6]
III	Asymmetric Key Cryptography 3.1 RSA Algorithm 3.2 Digital Envelope 3.3 Digital Signature	[4]
IV	Message Integrity Technique and Digital signature 4.1 Message Digest 4.2 MD5 , SHA 4.3 Digital Signature Technique	[4]
V	Digital Certificate and public key infrastructure 5.1 Digital certificates 5.2 Private key management 5.3 Public key cryptography standard	[5]
VI	Internet Security Protocol 6.1 Secure Socket Layer 6.2 TLS 6.3 SHTTP 6.4 Time stamping protocol 6.5 Secure Electronic standard 6.6 3-D secure protocol 6.7 Electronic money 6.8 Email security Protocol	[10]
VII	User Authentication 7.1 Password based authentication 7.2 Certificate based authentication	[4]

	7.3 Biometric authentication 7.4 Kerberos	
VIII	Practical Cryptography 8.1 Cryptography solution (using different programming language cryptographic Toolkits)	[5]
IX	Computer Forensic 9.1 Fundamentals of computer forensics 9.2 Computer forensic services 9.3 Types of computer forensics techniques 9.4 Specialized forensic techniques 9.5 Types of computer forensic systems	[6]

Books:

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, Security in Computing 5th edition, Prentice Hall, 2015
2. John R. Vacca, Computer Forensics Computer Crime Scene Investigation, Second Edition, 2015
3. Atul Kahate, Cryptography and Network Security Second Edition, McGraw Hill Education (India) Pvt Ltd, 2008
4. Andrew Tanenbaum, Computer Networks Fourth Edition, Prentice Hall, 2002

Web References:

1. <https://studentnotes88322212.wordpress.com/2018/05/08/security-in-computing-lecture-notes-study-materials-and-important-questions-answers>
2. http://www.brainkart.com/subject/Security-in-Computing_156/
3. <https://www.sciencedirect.com/topics/computer-science/diffie-hellman>
4. <https://www.forensiccontrol.com/>

M.Sc. - II Semester III**Subject: Computer Science****Elective - IV CSC5309: Digital Image Processing****[Credits-4]****Course Outcomes**

At the end of this course, students will be able to

- CO1** To learn the fundamental concepts of Digital Image Processing.
- CO2** To study basic image processing operations.
- CO3** To expose students to current applications in the field of digital image processing.
- CO4** To get the knowledge of digital image processing concepts and implementing in MATLAB.

Unit	Details	Lectures
I	Introduction 1.1 What is Digital Image Processing? 1.2 The origins of Digital Image Processing 1.3 Examples of Fields that use Digital Image Processing 1.4 Fundamental steps in Digital Image Processing 1.5 Components of an Image Processing System	[3]
II	Digital Image Fundamentals 2.1 Elements of Visual Perception 2.2 Image sensing and Acquisition 2.3 Image Sampling and Quantization 2.4 An Introduction to the Mathematical Tools Used in Digital 2.5 Image Processing	[6]
III	Intensity Transformation 3.1 Basic Intensity Transformation Functions 3.2 Histogram Processing 3.3 Histogram Equalization 3.4 Histogram Matching 3.5 Local Histogram Processing 3.6 Fourier Transformation 3.7 Sampled Functions 3.8 Discrete Fourier Transform (DFT) 3.9 Properties of 2-D Discrete Fourier Transform	[8]
IV	Filtering in Spatial and Frequency Domain 4.1 Fundamentals of Spatial Filtering 4.2 Image Smoothing Using Spatial Filters 4.3 Image Sharpening Using Spatial Filter 4.4 Basics of filtering in Frequency Domain 4.5 Image Smoothing Using Frequency domain Filters 4.6 Image Sharpening Using Frequency domain Filter	[5]
V	Image Restoration and Reconstruction 5.1 A Model of the Image Degradation / Restoration Process 5.2 Noise Models 5.3 Restoration in the Presence of Noise Only- Spatial Filtering 5.4 Periodic Noise Reduction by Frequency Domain Filtering 5.5 Estimating the Degradation Function 5.6 Minimum Mean Square Error(Wiener) Filtering	[6]
VI	Morphological Image Processing 6.1 Preliminaries 6.2 Erosion and Dilation	[8]

	6.3 Opening and Closing 6.4 The Hit-or-Miss Transformation 6.5 Some Basic Morphological Algorithms 6.6 Extraction of Connected Components	
VII	Image Segmentation 7.1 Fundamentals 7.2 Point, Line, and Edge Detection 7.3 Background 7.4 Detection of Isolated Points 7.5 Line Detection 7.6 Edge Models 7.7 Thresholding 7.8 Basic Global Thresholding	[7]
VIII	Representation and Description 8.1 Representation 8.2 Boundary (Border) Following 8.3 Chain Codes 8.4 Shape Numbers 8.5 Polygonal Approximations Using Minimum-Perimeter Polygons 8.6 Other Polygonal Approximation Approaches	[5]

Books:

1. Gonzalez, R. C., Woods, R. E., and Eddins, S. L., "Digital Image Processing Using MATLAB", 2nd ed., Gatesmark Publishing, Knoxville, TN, 2009
2. Gonzalez, R. C. and Woods, R. E. , "Digital Image Processing", 3rd ed., Prentice Hall, 2002/2008
3. Burger, Wilhelm and Burge, Mark J., "Digital Image Processing: An Algorithmic Introduction Using Java" , Springer, 2008,
4. A.K. Jain, "Fundamentals of digital image processing", PHI, 1995

Web References:

1. cs.auckland.ac.nz/courses/compsci773s1c/lectures/ImageProcessing-html/topic4.htm
2. <https://www.tutorialspoint.com/dip/index.htm>
3. <https://www.javatpoint.com/applications-of-digital-image-processing>

M.Sc. - II Semester III**Subject: Computer Science****Elective – IV CSC5310: Data Science using R****[Credits-4]****Course Outcomes**

At the end of this course, students will be able to

- CO1** Understand the basics of R programming.
CO2 Understand the statistical concept for data science.
CO3 Develop R codes for data science solutions.

Unit	Details	Lectures
I	Introduction to data science 1.1 What is data science? 1.2 Composition of data science 1.3 Analytics and its types 1.4 Role of AI and ML in data science 1.5 Nature of data 1.6 Technologies for data science	[6]
II	Introduction to R programming 2.1 Introduction to R-studio 2.2 mathematical and logical operators in R 2.3 Data types 2.4 simple operations and programs	[6]
III	Data structures and function in R 3.1 Vectors, Matrix, List 3.2 Data Frame, Factor 3.3 Control flow: If...else, If else() Function, Programming for loop While Loop, Break & next, Repeat Loop 3.4 Functions in R 3.5 Strings: String construction rules, String Manipulation functions	[10]
IV	More about R 4.1 R packages: Study of different packages in R 4.2 R Data Reshaping: Joining Columns and Rows in a Data Frame 4.3 Merging Data Frames, Melting and Casting 4.4 Working with files: Read and writing into different types of files	[10]
V	Data visualization in R and Data Management 5.1 Working with different charts 5.2 Histogram 5.3 Boxplot 5.4 Missing Value Treatment 5.5 Outlier Treatment 5.6 Sorting Datasets 5.7 Merging Datasets 5.8 Binning variables	[8]
VI	Statistical modelling in R 6.1 Mean, mode, median	[8]

	6.2 co-variance 6.3 correlation 6.4 Linear regression 6.5 Decision tree 6.6 K-means Clustering	
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Books:

1. Hadley Wickham, Garrett Golemund, "R for data scienc", O'Reilly
2. Norman Matloff, The Art of R Programming-a tour of statistical software design.
3. Nina Zumel , John Mount , Jim Porzak, Practical Data Science.

Web References:

1. www.datacamp.com/r-tutorial
2. <https://www.codecademy.com>
3. <https://www.edx.org> › course ›Introduction to R for Data Science

M.Sc. - II Semester III
Subject: Computer Science
Practical Paper -1 CSC5313: Project III

[Credits-4]

Objective:

The objective of project is to make the students understand Requirement analysis, design and implementation cycle. Any open problem statement can be taken for implementation. The system can be designed in any programming language implemented in any platform.

The Project can be platform, Language and technology independent. Project will be evaluated by project guide. Assessment will be done weekly in the respective batch. Evaluation will be on the basis of weekly progress of project work, progress report, oral, results and documentation and demonstration.

Student should fill their status of the project work on the progress report and get the signature of project guide regularly. Progress report should sharply focus how much time you have spent on specific task. (The format of progress report is given as follow.) Project will not be accepted if progress report is not submitted and all responsibility remains with student.

Project Progress Report

Roll No and Name of the Student	
Title of the project	
Project guide name	

Sr.	From Date	To Date	Details of Project work	Guide sign

M.Sc. - II Semester III
Subject: Computer Science
Practical Core Paper -1 CSC5401: Industrial Training

[Credits-8]

Course Outcomes

At the end of this course, students will be able to

- CO1** Get an insight into the actual work culture of the I.T. Industry.
- CO2** Aware of the skills and technologies needed to work in the I.T. industry.
- CO3** Understand Organizational structure of the company.

The necessary details for Industrial Training course are as follows:

A student can complete Industrial Training Project (ITP) in any I.T. industry / academic institute / with a research project of a teacher / an expert funded by any funding agency for a minimum period of three months.

1. There will be a teacher coordinator for a group of 10 students. A teacher coordinator is responsible to:

- Maintain a weekly status / progress report of the student.
- Keep in touch with the reporting authorities from industry for each student.
- Help the students to solve their difficulties.
- Arrange the meeting and presentations as per requirement.
- Guide each student for preparing final project report.
- Keep complete documentation record for each student separately.
- Internal assessment of each student for 50 marks.

The workload for this teacher coordinator is proposed as four hours per week.

The workload for a teacher coordinator who is guiding 3 students doing their ITP in Fergusson College (Autonomous) Pune (no mentor from industry) is proposed as four hours per week.

2. Guidelines for submitting the final project report:

The student must include the project completion certificate issued by the respective industry/research institute/educational institute in the report. A student will submit two hard bound copies and one CD: Student Copy, Department copy, Controller of Examinations copy of the work carried out during ITP (CD to be given by students).

3. Scheme of Assessment:➤ **Continuous Internal Assessment**

Evaluation for internal 50 Marks will be done by the Internal Teacher Coordinator.

Description	Marks
Weekly Reports (Minimum 12)	30
Final Project Report writing	10
Presentation Demo	10

➤ **End Semester Assessment**

Evaluation for external 50 Marks will be done by a panel of three consisting of One Industrial Expert, One Academic Expert (External from other college) and One Internal Examiner.

Each examiner is expected to assess each student for 50 marks independently and average of the three scores is to be considered as the final ESE score (out of 50).

Description	Marks
Knowledge and Execution of the System	15
Final Project Report	15
Presentation	10
Viva	10

The internal examiner(s) will be responsible for submitting the total marks out of 100 to examination section.

The final grade (to be printed on the mark list) is to be calculated on the basis of UGC 10 point scale.

Marks	Grade	Grade Point
90 – 100	O: Outstanding	10
80-89	A+ : Excellent	9
70-79	A: Very Good	8
65-69	B+ : Good	7
60 – 64	B: Above Average	6
55-59	C+ : Average	5
50 -54	C: Below Average	4
45-49	D : Satisfactory	3
40-44	E:Pass	2
0 -39	F : Fail	0
	Absent	0

Note: - A student who has obtained Grade F will have to carry out this project once again for a complete semester (minimum three months).