



Hindi Vidya Prachar Samiti's

Ramniranjan Jhunjhunwala College

of Arts, Science & Commerce

(Autonomous College)

Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for the M.Sc.

Program: M.Sc. COMPUTER-SCIENCE

Program Code: RJSPCS

(CBCS 2021-2022)

THE PREAMBLE

Why Computer Science ?

Education is the key to development of any society. Role of higher education is crucial for securing right kind of employment and also to pursue further studies in best available world class institutes elsewhere within and outside India. Quality education in general and higher education in particular deserves high priority to enable the young and future generation of students to acquire skill, training and knowledge in order to enhance their thinking, creativity, comprehension and application abilities and prepare them to compete, succeed and excel globally. Sustained initiatives are required to reform the present higher education system for improving and upgrading the academic resources and learning environments by raising the quality of teaching and standards of achievements in learning outcomes.

Why Computer Science at R J College?

The Computer Science department was established in the year 1999 with strength of 60 Students and M.Sc CS with strength of 40 Seats was introduced in the year 2001. Today the strength has reached to 120 at UG level and 48 at PG level. The department offers both UG and PG programs in the subject of CS and is affiliated to, and recognized by the University of Mumbai. College facilitate departmental library with near about 1200+ books. There are 3 dedicated well-upgraded laborites for CS department. With the management extensive support, department believes in "**1 Student 1 PC policy**" which helps students to rigorous practice and focus. Projects, hands on training sessions, guest lectures, laboratory experimentation, lecture-based learning, industry visits etc. motivate students to explore more in terms of applications of the subject. Under autonomy, the department has made curriculum more robust by incorporating skill-based learning and value added course that imparts practical knowledge of the subject to the students. Department of CS (DBT), New Delhi has identified CS Department of R J College as DBT Star College Department which has further strengthened our hands in being able to provide hands on training to the students to satisfy their curiosity.

M.Sc Computer-Science Syllabus Semester I & II

Our Curriculum, Your Strength

This syllabus is an honest attempt to include following ideas, among other things, into practice:

- Bring a new approach to syllabus, not a revision of the existing syllabus.
- Create a unique identity for MSC in Computer Science distinct from similar degrees in other related subjects.
- Offers focus on core Computer Science subjects.
- Incorporate advanced and most recent trends.
- Identify and nurture research temper among students.
- Offer provision for internship with industry at semester IV.
- Focus, as far as possible, only on open source software.

This syllabus for the semester I and semester II have initiated steps to meet these goals. By extending the syllabus to semester III and semester IV, it is assumed that these goals will be met to a larger extent. In order to give an impetus to research among students, one of the courses in semester - I gives an overview on how to do research in Computer Science. In a nutshell, the core philosophy of the syllabus is to - (i) Give strong foundation on core Computer Science subjects (ii) expose the student to emerging trends in a gradual and incremental way (iii) create a research temper among students in the whole process (v) Prepare student community for the demands of ICT industry. We hope that the student and teaching community will appreciate the thrust, direction and treatment given to the courses in the syllabus. We sincerely believe that a student who takes up this course will be better fit for industry as he or she will have strong foundation on fundamentals and exposure to advanced and emerging trends. We earnestly believe that by focusing on student driven research, learning will be more interesting and stimulating.

M.Sc Computer-Science Syllabus Semester I & II**DISTRIBUTION OF TOPICS AND CREDITS****M.Sc. COMPUTER-SCIENCE SEMESTER I**

Course	Nomenclature	Credits	Topics
RJSPCS101	Analysis of Algorithms and Researching Computing	04	1. Introduction To Algorithm 2. Sorting & shortest path techniques. 3. Algorithms 4. Research methods
RJSPCS102	Fundamental of Data Science	04	1. Introduction to Data Science 2. Probability 3. Probability – Distributions 4. Histogram
RJSPCS103	Bio-Informatics	04	1. Introduction to Bioinformatics. 2. Biological Databases 3. Sequence Analysis 4. Structure Prediction
RJSPCS104	Data Warehousing & Data Mining	04	1 Introduction to Business Intelligence 2. Introduction to Business Data Warehouse 3. Designing Business Data Warehouse 4. Introduction to Data Mining
RJSPCSP101	Analysis of Algorithms and Researching Computing (RJSPCS101) and Fundamental of Data Science (RJSPCS102)	04	Sorting & shortest path techniques, Algorithms, Probability, Probability – Distributions, Histogram
RJSPCSP102	Bio-Informatics (RJSPCS103) and Data Warehousing & Data Mining (RJSPCS104)	04	Biological Databases, Sequence Analysis, Structure Prediction, Designing Business Data Warehouse, Data Mining.

M.Sc Computer-Science Syllabus Semester I & II**M.Sc. COMPUTER-SCIENCE SEMESTER II**

Course	Nomenclature	Credits	Topics
RJSPCS201	Design And Implementation of Modern Compilers	04	1. Introduction to Compiler. 2. Automatic Construction of Efficient Parsers 3. Advanced syntax analysis and basic semantic analysis 4. Dataflow analysis and loop optimization
RJSPCS202	Advance Embedded Systems	04	1. Embedded Electronic Systems 2. Overview of MSP 430 3. Digital Input, Output, Displays 4. Analog Input/output & Communications.
RJSPCS203	Social Network Analysis	04	1. Introduction to SNA. 2. Evolution in Social Networks 3. Mining Communities 4. Two-mode networks for SNA.
RJSPCS204A	Business Intelligence & Big Data Analytics	04	1. Introduction to Big data 2. Hadoop Ecosystem and its components 3. Shingling of documents. 4. Mining Data Streams
RJSPCS204B	Digital Image Processing	04	1. Introduction to DIP 2. Image Enhancement Methods 3. Types of Image Processing. 4. Image Representation & Description, Compression & Segmentation
RJSPCSP201	Design and implementation of Modern Compilers with mini project (RJSPCS201) And	04	Automatic Construction of Efficient Parsers, Advanced syntax analysis and basic semantic analysis, Dataflow analysis and loop optimization, MSP 430, Digital Input, Output, Displays, Analog Input/output & Communications.

M.Sc Computer-Science Syllabus Semester I & II

	Advanced Embedded System with mini project (RJSPCS202)		
RJSPCSP202	Social Network Analysis with mini project (RJSPCS203) And Business Intelligence and Big Data Analytics with mini project (RJSPCS204A) / Digital Image Processing (RJSPCS204B)	04	Evolution in Social Networks, Mining Communities, Two-mode networks for SNA, Hadoop Ecosystem and its components, Shingling of documents, Mining Data Streams. / Image Enhancement Methods Types of Image Processing. Image Representation & Description, Compression & Segmentation

M.Sc Computer-Science Syllabus Semester I & II

SEMESTER I (THEORY)		L	Cr
Paper-I: Analysis of Algorithms and Researching Computing	Paper Code: RJSPCS101	60	4
UNIT I		15	
INTRODUCTION TO ALGORITHM			
1	Introduction : The Role of Algorithms in Computing, Analyzing algorithms, Loop Invariance		
2	Divide-and-Conquer: The maximum-subarray problem , Strassen's algorithm for matrix multiplication, The substitution method for solving recurrences ,The recursion-tree method for solving recurrences, The master method for solving recurrences.		
3	Probabilistic Analysis and Randomized Algorithms: The hiring problem, Indicator random variables, Randomized algorithms		
UNIT II		15	
SORTING AND SHORTEST PATH TECHNIQUES			
1	Heap sort : Heaps, Maintaining the heap property, Building a heap ,The heap sort algorithm. Sorting in Linear Time: Lower bounds for sorting, Counting sort, Radix sort ,Bucket sort.		
2	Medians and Order Statistics: Minimum and maximum, Selection in expected linear time, Selection in worst-case linear time. All-Pairs Shortest Paths: Shortest paths and matrix multiplication, The Floyd-Warshalls algorithm, Johnson's algorithm for sparse graphs.		
UNIT III		15	
ALGORITHMS			
1	Multithreaded Algorithms: The basics of dynamic multithreading, Multithreaded matrix multiplication, Multithreaded merge sort. Linear Programming: Standard and slack forms ,Formulating problems as linear programs, The simplex algorithm, Duality ,The initial basic feasible solution.		

M.Sc Computer-Science Syllabus Semester I & II

	Number-Theoretic Algorithms: Elementary number-theoretic notions , Greatest common divisor ,Modular arithmetic ,Solving modular linear equations ,The Chinese remainder theorem ,Powers of an element ,The RSA public-key cryptosystem.		
2	Approximation Algorithms: The vertex-cover problem ,The traveling-salesman problem,The set-covering problem, Randomization and linear programming, The subset-sum problem.processing: components of NLP, steps in NLP, Expert System: components of expert system, Knowledge base: components of knowledge base.		
	UNIT IV	15	
	RESEARCH METHODS		
1	Introduction, purpose and products of research, overview of research process, internet research, participants and research ethics, reviewing literature, design and creation..		
2	experiments, Quantitative data analysis, presentation of research.		

M.Sc	Semester I Theory
RJSPCS101	Course Outcomes 1.1:
Paper I	<ol style="list-style-type: none"> 1. Analyze the asymptotic performance of algorithms. 2. Write rigorous correctness proofs for algorithms. 3. Demonstrate a familiarity with major algorithms and data structures. 4. Apply important algorithmic design paradigms and methods of analysis. 5. To understand the process of researching computing
Analysis of Algorithms and Researching Computing	Learning Outcomes: <ol style="list-style-type: none"> 1. Argue the correctness of algorithms using inductive proofs and invariants. 2. Analyze worst-case running times of algorithms using asymptotic analysis. 3. Explain what competitive analysis is and to which situations it applies. perform competitive analysis. 4. Insights of researching computing

M.Sc Computer-Science Syllabus Semester I & II

SEMESTER I (THEORY)		L	Cr
Paper-II: Fundamentals Of Data Science	Paper Code: RJSPCS102	60	4
UNIT I		15	
INTRODUCTION TO DATA SCIENCE			
1	The Field of Data Science – The Various Data Science Disciplines, Difference between Analysis and Analytics, Business Analytics, Data Analytics.		
2	Data Science: An Introduction Continuing with BI, ML, and AI, The Field of Data Science, Popular Data Science Techniques.		
UNIT II		15	
PROBABILITY			
1	The Basic Probability Formula, Computing Expected Values, Frequency, Events and Their Complements. Probability – Combinatorics Permutations, Simple Operations with Factorials, Solving Variations with Repetition, Solving Variations without Repetition.		
2	Combinations, Symmetry of Combinations, Solving Combinations with Separate Sample Spaces. Probability - Bayesian Inference Sets and Events, The Conditional Probability, The Law of Total Probability		
UNIT III		15	
PROBABILITY DISTRIBUTION			
1	Discrete Distributions, Discrete Distributions: The Uniform Distribution, Discrete Distributions: The Bernoulli Distribution, Discrete Distributions: The Binomial Distribution, Discrete Distributions: The Poisson Distribution, Continuous Distributions, Continuous Distributions: The Normal Distribution, Continuous Distributions: The Students' T Distribution.		

M.Sc Computer-Science Syllabus Semester I & II

2	Continuous Distributions: The Chi-Squared Distribution, Continuous Distributions: The Exponential Distribution, Continuous Distributions: The Logistic Distribution Statistics: Population and Sample, Types of Data, Levels of Measurement, Categorical Variables – Visualization Techniques, Numerical Variables - Frequency Distribution Table		
	UNIT IV	15	
	THE HISTOGRAM		
1	Cross Tables and Scatter Plots, Mean, median and mode Skewness, Variance, Standard Deviation and Coefficient of Variation Covariance, Correlation Coefficient, The Standard Normal Distribution Central Limit Theorem, Standard error, Estimators and Estimates Confidence Intervals; Population Variance Known; Z-score Confidence Intervals; Population Variance Unknown; T-score Margin of Error, Confidence intervals. Two means. Dependent & Independent samples.		
2	Hypothesis Testing Null vs Alternative Hypothesis, Rejection Region and Significance Level, Type I Error and Type II Error Test for the Mean. Population Variance Known, p-value.		

M.Sc	Semester I Theory
RJSPCS102 Paper II Fundamentals Of Data Science	<p>Course Outcomes 1.2:</p> <p>Apply important algorithmic design paradigms and methods of analysis.</p> <p>To introduce mathematical statistical computing with practical approach</p> <p>Learning Outcomes:</p> <p>The Students will get in-depth knowledge of data science related Mathematical and statistical computing concepts.</p>

M.Sc Computer-Science Syllabus Semester I & II

SEMESTER I (THEORY)		L	Cr
Paper-III: BioInformatics	Paper Code: RJSPCS103	60	4
UNIT I		15	
INTRODUCTION TO BIOINFORMATICS			
1	Introduction to Bioinformatics Definition and History and Applications of Bioinformatics, Internet resources, various databases and bioinformatics tools, organization of databases.		
2	The biological sequence structure deficit- Genome Projects-pattern recognition and prediction.		
UNIT II		15	
BIOLOGICAL DATABASE			
1	Nucleic acid sequence databases, Protein sequence databases, Repositories for high throughput genomic sequences, Genome Databases, 3D Structure Database, Chemical Structure database, Gene Expression database.		
2	Derived Databases, Structure classification database, Protein-Protein interaction database and Pathway database.		
UNIT III		15	
SEQUENCE ANALYSIS			
1	File formats, Basic concepts of sequence analysis, Scoring matrices, Pair wise sequence alignments, Multiple sequence alignment.		
2	Database Searches: Keyword-based searches and Sequence-based searches. Profile-based searches, Markov chains and applications.		
UNIT IV		15	
STRUCTURE PREDICTION			

M.Sc Computer-Science Syllabus Semester I & II

1	Overview and Introduction to Protein Structure, Sequence-Sequence Alignment Methods, Sequence Based Secondary Structure Prediction. Visualization of structures using Rasmol or SPDBV.		
2	Fundamentals of the methods for 3D structure prediction, Homology/comparative Modeling, fold recognition, threading approaches, and ab initio structure prediction methods. Use of modeller.		

M.Sc	Semester I Theory
RJSPCS103 Paper III BioInformatics	<p>Course Outcomes 1.3:</p> <ol style="list-style-type: none"> 1. The basic objective is to give students an introduction to the basic practical techniques of bioinformatics. 2. Emphasis will be given to the application of bioinformatics and biological databases to problem solving in real research problems. 3. The students will become familiar with the use of a wide variety of internet applications, biological database and will be able to apply these methods to research problems. <p>Learning Outcomes:</p> <ol style="list-style-type: none"> 1. The students will be able to describe the contents and properties of the most important bioinformatics databases, perform text- and sequence-based searches, and analyze and discuss the results in light of molecular biological knowledge 2. The students will be able to explain the major steps in pair wise and multiple sequence alignment, explain the principle for, and execute pair wise sequence alignment by dynamic programming. 3. The students will be able to predict the secondary and tertiary structures of protein sequences.

M.Sc Computer-Science Syllabus Semester I & II

SEMESTER I (THEORY)		L	Cr
Paper-IV: Data Warehousing and Data Mining	Paper Code: RJSPCS104	60	4
UNIT I		15	
INTRODUCTION TO BUSINESS INTELLIGENCE			
1	Operational and Decision Support System, Data-Information-Knowledge-Decision making-Action cycle. Basic definitions- Business Intelligence; Data warehousing, Business Intelligence architecture, Use and benefits of Business Intelligence. Knowledge Discovery in Databases: KDD process model.		
2	Data Pre-processing: Cleaning: Missing Values; Noisy Values; Inconsistent values; redundant values. Outliers, Integration, transformation, reduction, Discretization: Equal Width Binning; Equal Depth Binning, Normalization, Smoothing.		
UNIT II		15	
INTRODUCTION TO BUSINESS DATA WAREHOUSE			
1	Definition of Data warehouse, Logical architecture of Data Warehouse, Data Warehouse model- Enterprise warehouse; Data Marts; Virtual warehouse.		
2	Populating business Data Warehousing: data integration and extract, transform, load (ETL).		
UNIT III		15	
DESIGNING BUSINESS DATA WAREHOUSE			
1	OLTP and OLAP systems, Designing business information warehouse: Principles of dimensional modeling, Data cubes, Data cube operations, data cube schemas.		
UNIT IV		15	

M.Sc Computer-Science Syllabus Semester I & II

	<i>INTRODUCTION TO DATA MINING</i>		
1	Data mining definitions and process: business and data understanding, Data mining techniques. Data Mining Algorithms: Classification, Clustering, Association rules.		
2	Classification Challenges, Distance based Algorithm: K nearest Neighbors and kD-Trees, Rules and Trees based Classifiers, Information gain theory, Statistical based classifiers: Bayesian classification, Document classification, Bayesian Networks. Introduction to Support Vector Machines.		

M.Sc	Semester I Theory
RJSPCS104 Paper IV Data Warehousing and Data Mining	<p>Course Outcomes 1.4:</p> <ol style="list-style-type: none"> 1. Be familiar with mathematical foundations of data mining tools. 2. Understand and implement classical models and algorithms in data warehouses and data mining. 3. Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering. 4. Understands the concepts of a data warehouse in which users can find data more quickly and thus establishes information and knowledge faster. 5. All the goals of the data warehouse serve the aims of Business Intelligence making better decisions faster at all levels within the organization and even across organizational boundaries. <p>Learning Outcomes:</p> <ol style="list-style-type: none"> 1. Students will be able to: Design data warehouse with dimensional modeling and apply OLAP operations. 2. Identify appropriate data mining algorithms to solve real world problems. Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining.

M.Sc Computer-Science Syllabus Semester I & II

SEMESTER II (THEORY)		L	Cr
Paper-I: Design and implementation of Modern Compilers	Paper Code: RJSPCS201	60	4
UNIT I		15	
INTRODUCTION TO COMPILER			
1	The structure of a compiler, A simple approach to the design of lexical analyzers, Regular expressions, Finite automata, From regular expressions to finite automata, Minimizing the number of states of a DFA.		
2	Context-free grammars, Derivations and Parse trees. Simple precedence Grammar, Parsing using SPM.		
UNIT II		15	
AUTOMATIC CONSTRUCTION OF EFFICIENT PARSERS			
1	Parsers, Shift-reduce parsing, Top- down parsing, Predictive parsers.		
2	LR parsers, Constructing SLR parsing tables, Constructing LALR parsing tables.		
UNIT III		15	
ADVANCED SYNTAX ANALYSIS AND BASIC SEMANTIC ANALYSIS			
1	Syntax-directed translation schemes, Implementation of syntax-directed translators, translation to intermediate code.		
2	intermediate code and its type.		
UNIT IV		15	
DATAFLOW ANALYSIS AND LOOP OPTIMIZATION			

M.Sc Computer-Science Syllabus Semester I & II

1	The principle sources of optimization, Loop optimization: The DAG representation of basic blocks, Dominators, Reducible flow graphs, Loop-invariant computations, Induction variable elimination.		
2	Some other loop optimizations. Dataflow Analysis: intermediate representation for flow analysis, various dataflow analyses, transformations using dataflow analysis, speeding up dataflow analysis.		

M.Sc	Semester II Theory
RJSPCS201 Paper I Design and implementation of Modern Compilers	Course Outcomes 2.1: 1. The Objectives of this course is to explore the principles, algorithms, and data structures involved in the design and construction of compilers. Topics include context-free grammars, lexical analysis, parsing techniques, symbol tables, error recovery, code generation, and code optimization. Learning Outcomes: After completion of this course each student will implement a compiler for a small programming language.

M.Sc Computer-Science Syllabus Semester I & II

SEMESTER II (THEORY)		L	Cr
Paper-II: Advanced Embedded System	Paper Code: RJSPCS202	60	4
UNIT I		15	
EMBEDDED ELECTRONIC SYSTEMS & MICROCONTROLLERS			
1	Embedded Electronic Systems & Microcontrollers : What (and Where) Are Embedded Systems?, Approaches to Embedded Systems, Small Microcontrollers, Anatomy of a Typical Small Microcontroller, Memory, Software, Where Does the MSP430 Fit? Instruments MSP430 : The Outside View—Pin-Out, The Inside View—Functional Block Diagram, Memory, Central Processing Unit, Memory-Mapped Input and Output, Clock Generator, Exceptions: Interrupts and Resets, Where to Find Further Information.		
2	Development: Development Environment, The C Programming Language, Assembly Language, Access to the Microcontroller for Programming and Debugging, Demonstration Boards, Hardware, Equipment.		
UNIT II		15	
OVERVIEW OF MSP 430			
1	Overview of MSP 430 : First Program on a Conventional Desktop Computer, Light LEDs in C, Light LEDs in Assembly Language, Read Input from a Switch, Automatic Control: Flashing Light by Software Delay, Automatic Control: Use of Subroutines, Automatic Control: Flashing Light by Polling Timer_A, Header Files and Issues Brushed under the Carpet. Architecture of MSP430 processor: Central Processing Unit, Addressing Modes, Constant Generator and Emulated Instructions, Instruction Set, Examples, Reflections on the CPU and Instruction Set, Resets, Clock System.		
2	Functions, Interrupts & low power modes: Functions and Subroutines, What Happens when a Subroutine Is Called?, Storage for Local Variables, Passing Parameters to a Subroutine and Returning a Result, Mixing C and		

M.Sc Computer-Science Syllabus Semester I & II

	Assembly Language, Interrupts, What Happens when an Interrupt Is Requested?, Interrupt Service Routines, Issues Associated with Interrupts, Low-Power Modes of Operation.		
UNIT III		15	
DIGITAL INPUT, OUTPUT, DISPLAYS			
1	Digital Input, Output, Displays : Digital Input and Output: Parallel Ports, Digital Inputs, Switch Debounce, Digital Outputs, Interface between 3V and 5V Systems, Driving Heavier Loads, Liquid Crystal Displays, Driving an LCD from an MSP430x4xx, Simple Applications of the LCD.		
2	Timers : Watchdog Timer, Basic Timer1, Timer_A, Measurement in the Capture Mode, Output in the Continuous Mode, Output in the Up Mode: Edge-Aligned Pulse-Width Modulation, Output in the Up/Down Mode: Centered Pulse-Width Modulation, Operation of Timer_A in the Sampling Mode, Timer_B, What Timer Where?, Setting the Real-Time Clock: State Machines.		
UNIT IV		15	
ANALOG INPUT/OUTPUT & COMMUNICATION			
1	Analog Input/output : Comparator_A, Analog-to-Digital Conversion: General Issues, Analog-to-Digital Conversion: Successive Approximation, The ADC10 Successive-Approximation ADC, Basic Operation of the ADC10, More Advanced Operation of the ADC10, The ADC12 Successive-Approximation ADC, Analog-to-Digital Conversion: Sigma-Delta, The SD16_A Sigma-Delta ADC, Operation of SD16_A, Signal Conditioning and Operational Amplifiers, Digital-to-Analog Conversion.		
2	Communication : Communication Peripherals in the MSP430, Serial Peripheral Interface, SPI with the USI, SPI with the USCI, A Thermometer Using SPI in Mode 3 with the F2013 as Master, A Thermometer Using SPI in Mode 0 with the FG4618 as Master, Inter-integrated Circuit Bus, A Simple I ² C Master with the USCI_B0 on a FG4618, A Simple I ² C Slave with the USI on a F2013, State Machines for I ² C Communication, A Thermometer Using I ² C with the F2013 as Master, Asynchronous Serial Communication, Asynchronous Communication with the USCI_A, A Software UART Using Timer_A, Other Types of Communication.		

M.Sc Computer-Science Syllabus Semester I & II

M.Sc	Semester II Theory
RJSPCS202	Course Outcomes 2.2:
Paper II	<ol style="list-style-type: none">1. Discuss the major components that constitute embedded systems.2. Implement small program to solve well-defined problems on an embedded Platforms.3. Develop familiarity with tools used to develop in an embedded environment.
Advanced Embedded System	Learning Outcomes: <ol style="list-style-type: none">1. Understand what is micro controller, microprocessor, embedded systems.2. Understand different components of a micro-controller and their interactions.3. Become familiar with programming environment used to develop embedded systems.4. Understand key concepts of embedded systems like I/O, timers, interrupts, interaction with peripheral devices. Learn debugging for an embedded system.

M.Sc Computer-Science Syllabus Semester I & II

SEMESTER II (THEORY)		L	Cr
Paper-III: Social Network Analysis	Paper Code: RJSPCS203	60	4
UNIT I		15	
INTRODUCTION TO SNA			
1	Introduction to Web - Limitations of current Web, Development of Semantic Web , Emergence of the Social Web , Statistical Properties of Social Networks , Network analysis , Development of Social Network Analysis , Key concepts and measures in network analysis , Discussion networks ,Blogs and online communities , Web-based networks.		
2	Visualization and application of social network: Graph Theory, Centrality, Clustering, Matrix representation, Hybrid Representation, Visualizing online social data.		
UNIT II		15	
EVOLUTION IN SOCIAL NETWORKS			
1	Evolution in Social Networks : Framework ,Tracing Smoothly Evolving Communities ,Models and Algorithms for Social Influence Analysis, Influence Related Statistics ,Social Similarity and Influence, Influence Maximization in Viral Marketing.		
2	Algorithms and Systems for Expert Location in Social Networks , Expert Location without Graph Constraints , with Score propagation ,Expert Team Formation ,Link prediction in Social Networks .		
UNIT III		15	
MINING COMMUNITIES			
1	Mining Communities : Aggregating and reasoning with social network data, Advanced Representations Extracting evolution of Web Community from a Series of Web Archive , Deflecting Communities in Social Networks , Evaluating Communities , Core Methods for community Detection & Mining ,Applications of Community mining, Algorithms ,Node Classification in Social Networks.		

M.Sc Computer-Science Syllabus Semester I & II

2	Predicting Human Behavior and Privacy Issues: understanding and predicting human behavior for social communities, enabling new human experience, Context awareness privacy in online social networks - Trust in online environment.		
	UNIT IV	15	
	TWO MODE DATA		
1	Measures of similarity and structural equivalence in SNA: Approaches to network positions and social roles- defining equivalence or similarity, structural equivalence, automorphic equivalence, finding equivalence, Measuring similarity/dissimilarity.		
2	Two-mode networks for SNA: Understanding mode networks- Bi-partite data structures, visualizing two-mode data, quantitative analysis using two-mode Singular value decomposition (SVD) analysis, two-mode core-periphery analysis, faction analysis.		

M.Sc	Semester II Theory
RJSPCS203	Course Outcomes 2.3:
Paper III	<ol style="list-style-type: none"> 1. To understand the components of the social network 2. To model and visualize the social network 3. To mine the users in the social network 4. Understand human behavior in social web and related communities.
Social Network Analysis	Learning Outcomes: Upon completion of the course, the student should be able to: <ol style="list-style-type: none"> 1. Represent knowledge using ontology 2. Predict human behavior in social web and related communities 3. Visualize social networks. 4. Develop semantic web related applications.

M.Sc Computer-Science Syllabus Semester I & II

M.Sc Computer-Science Syllabus Semester I & II

SEMESTER II (THEORY)		L	Cr
Paper-IV: Business Intelligence and Big Data Analytics	Paper Code: RJSPCS204A	60	4
UNIT I		15	
INTRODUCTION TO BI			
1	What is Big Data technology? ; Types of Big data technology ; Top Big Data Technologies ; Emerging big data technologies. Link analysis: PageRank, Efficient Computation of PageRank.		
2	Recommendation Systems: Introduction ; popularity based model, Hybrid models, content based recommendation system, collaborative filtering (user similarity and Item similarity)		
UNIT II		15	
HADOOP ECOSYSTEM AND ITS COMPONENTS			
1	HDFS, YARN, MapReduce, Apache Spark Hive , H Base, H Catalogue, Apache Pig Apache Sqoop, Oozie, Avvo.		
2	Apache Drill Apache ZooKeeper, Apache Flume, Apache Ambari.		
UNIT III		15	
SHINGLING OF DOCUMENTS			
1	Finding Similar Items, Applications of Near-Neighbor Search, Jaccard similarity of sets, Similarity of documents, Collaborative filtering as a similar-sets problem, Documents, k- Shingles, Choosing the Shingle Size, Shingles built from Words.		
2	Similarity-Preserving Summaries of Sets, Locality-Sensitive hashing for documents.		

M.Sc Computer-Science Syllabus Semester I & II

	UNIT IV	15	
	MINING DATA STREAMS		
1	Introduction to streams concepts - Stream data model and architecture, Stream computing, Sampling data in a stream, Filtering streams, Counting distinct elements in a stream, Estimating moments.		
2	Counting oneness in a Window, Decaying window, Real time analytics Platform(RTAP).		

M.Sc	Semester II Theory
RJSPCS204A Paper IV Business Intelligence and Big Data Analytics	<p>Course Outcomes 2.4A:</p> <ol style="list-style-type: none"> 1. Understand the Big Data Platform and its Use cases. 2. Provide an overview of Apache Hadoop 3. Provide HDFS Concepts and Interfacing with HDFS 4. Understand Map Reduce Jobs 5. Provide hands on Hadoop Eco System 6. Apply analytics on Structured, Unstructured Data. <p>Learning Outcomes:</p> <ol style="list-style-type: none"> 1. List the components of Hadoop and Hadoop Eco-System. 2. Access and Process Data on Distributed File System. 3. Manage Job Execution in Hadoop Environment. 4. Develop Big Data Solutions using Hadoop Eco System.

M.Sc Computer-Science Syllabus Semester I & II

SEMESTER II (THEORY)		L	Cr
Paper-IV: Digital Image Processing	Paper Code: RJSPCS204B	60	4
UNIT I		15	
INTRODUCTION TO DIP			
1	Digital Image Processing Systems: Introduction, Structure of human eye, Image formation in the human eye, Brightness adaptation and discrimination, Image sensing and acquisition, Storage, Processing, Communication, Display. Image sampling and quantization, Basic relationships between pixels		
2	Image Transforms (Implementation): Introduction to Fourier transform, DFT and 2-D DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Optimum transform: Karhunen - Loeve (Hotelling) transform.		
UNIT II		15	
IMAGE ENHANCEMENT METHODS			
1	Image Enhancement in the Spatial Domain: Gray level transformations, Histogram processing, Arithmetic and logic operations, Spatial filtering: Introduction, Smoothing and sharpening filters		
2	Image Enhancement in the Frequency Domain: Frequency domain filters: Smoothing and Sharpening filters, Homomorphic filtering.		
UNIT III		15	
TYPES IMAGE PROCESSING			
1	Wavelets and Multiresolution Processing: Image pyramids, Subband coding, Haar transform, Series expansion, Scaling functions, Wavelet functions, Discrete wavelet transforms in one dimensions, Fast wavelet transform, Wavelet transforms in two dimensions.		

M.Sc Computer-Science Syllabus Semester I & II

2	Morphological Image Processing: Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Morphological algorithm operations on binary images, Morphological algorithm operations on gray-scale images		
	UNIT IV	15	
	IMAGE REPRESENTATION & DESCRIPTION, COMPRESSION & SEGMENTATION		
1	Image Data Compression: Fundamentals, Redundancies: Coding, Interpixel, Psycho-visual, Fidelity criteria, Image compression models, Error free compression, Lossy compression, Image compression standards: Binary image and Continuous tone still image compression standards, Video compression standards.		
2	Image Segmentation: Detection of discontinuities, Edge linking and Boundary detection, Thresholding, Region based segmentation Image Representation and Description: Representation schemes, Boundary descriptors, Regional descriptors.		

M.Sc	Semester II Theory
RJSPCS204B	Course Outcomes 2.4B:
Paper IV	1. Describe and explain basic principles of DIP.
Digital Image Processing	2. Design and implement algorithms that perform basic image processing (e.g. noise removal & image enhancement) .
	3. Design and implement algorithms for advance image analysis(e.g. image compression & image segmentation).
	Learning Outcomes:
	1. Analyze general terminology of DIP.
	2. Examine various types of images, intensity transformation & spatial filtering.
	3. Develop FT for IP in frequency domain.
	4. Evaluate the methodologies for image segmentation, restoration etc.

M.Sc Computer-Science Syllabus Semester I & II

M.Sc Computer-Science Syllabus Semester I & II

Semester I (PRACTICALS)	
Practical-I: Analysis of Algorithms & Researching Computing + Fundamentals Of Data Science	Paper Code: RJSPCSP101 (RJSPCS101 + RJSPCS102)
Analysis of Algorithms & Researching Computing	
1	Write a Program for Randomized Selection Algorithm
2	Write a Program for Heap sort Algorithm.
3	Write a Program to perform Radix sort Algorithm.
4	Write a Program to perform Bucket Sort Algorithm.
5	Write a Program to perform Folyd-Warshall Algorithm.
6	Write a Program for Counting Sort Algorithm.
7	Write a Program for set Covering Problem.
8	Write a Program for found a subset with given sum.
9	Write a Program for Travelling Sales man problem.
10	Write a Program for Hash Table.
Fundamentals Of Data Science	
1	Exploratory data analysis.
2	Exploring Binary and categorical data
3	Data and sampling distributions.

M.Sc Computer-Science Syllabus Semester I & II

4	Solving Combinations with Separate Sample Spaces
5	Bayesian Inference
6	Probability Distributions
7	Descriptive Statistics
8	Inferential Statistics
9.	Test for the mean of Independent Samples and dependent Samples
10	Hypothesis Testing
Practical-II: Bio Informatics + Data Warehousing and Data Mining	
Paper Code: RJSPCSP102 (RJSPCS103 + RJSPCS104)	
Bio Informatics	
1	Write a Python/Java code to perform pairwise alignment.
2	Write a Python/Java code to find the identity value of a given sequences.
3	Write a Python/Java code to find the Similarity value of a given sequences.
4	Write a python/java program to find consensus sequence using Multiple Sequence Alignment (MSA) technique.
5	Write a Python/Java code to find motif in a given sequence.
6	Perform a BLAST search on any genes sequence and write a java/python code to count the no of repetition of each nucleotide in the sequence.
7	Write Python/Java code to find regular expressions for given sequences.
8	write a program to find a fingerprint of given sequences.
Data Warehousing and Data Mining	
1	Creation of database in Microsoft Management Studio.
2	Import database in Business Intelligence Project.

M.Sc Computer-Science Syllabus Semester I & II

3	Star Schema table, snowflake Schema table.
4	Cube using cube wizard.
5	Dimension tables.
6	Firing queries on the cube.
7	Excel Pivot Chart.
8	Data pre-processing.
9	Data discretization.
10	Classification problems.
11	Clustering Analysis.
12	Association Rule Mining.
13	Data visualization.

M.Sc Computer-Science Syllabus Semester I & II

MSc	Semester I (Practical)
RJSPCSP101 (RJSPCS101+ RJSPCS102)	Analysis of algorithms & researching computing <p>Course Outcomes:</p> <ol style="list-style-type: none"> 1. To implement a randomized selection algorithm. 2. To implement sorting algorithms. 3. To implement all-pair shortest path algorithms. 4. To implement approximation algorithms. <p>Learning outcomes:</p> <ol style="list-style-type: none"> 1. Understanding randomized selection algorithms. 2. Understanding sorting algorithms like heap sort, radix sort, bucket sort, counting sort. 3. Understanding Floyd-warshall all-pair shortest path algorithm. 4. Understanding travelling-salesman approximation algorithms. <p>Fundamentals of Data Science</p> <p>Course Outcomes:</p> <ul style="list-style-type: none"> • To develop relevant programming abilities. • To demonstrate proficiency with statistical analysis of data. • To develop the ability to build and assess data-based models. • To execute statistical analyses with professional statistical software Python. • To demonstrate skill in data management. <p>Learning outcomes:</p> <p>Students will learn to apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively</p>
RJSPCSP102 (RJSPCS103+	Bioinformatics <p>Course Outcomes:</p>

M.Sc Computer-Science Syllabus Semester I & II

RJSPCS104)	<p>1. To impart practical exposure upon Bioinformatics tools and databases.</p> <p>Learning outcomes:</p> <p>This laboratory course will prepare the students for various applications of bioinformatics in life science research.</p> <p>1) Introduction to various databases of proteins, nucleic acids. Primary, secondary and composite databases.</p> <p>2) BLAST, FASTA</p> <p>3) Developing different algorithms for sequence analysis.</p> <p>Data Warehousing and Data Mining :</p> <p>Course Outcome:</p> <p>1. This course gives an introduction to methods and theory for development of data warehouse and data analysis using data mining.</p> <p>2. Data quality and methods and techniques for preprocessing of data.</p> <p>3. Modeling and design of data warehouses.</p> <p>4. Algorithms for classification, clustering and association rule analysis.</p> <p>5. Practical use of software data analysis.</p> <p>Learning Outcome:</p> <p>1. The candidate will get knowledge of data preprocessing and data quality.</p> <p>2. The candidate will get knowledge of modeling and design of data warehouse; Algorithms for data mining.</p> <p>3. The students will be able to design data warehouse; Ability to apply acquired knowledge for understanding data and select suitable methods for data analysis.</p>
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M.Sc Computer-Science Syllabus Semester I & II

Semester II (PRACTICALS)	
Practical-I: Design and implementation of Modern Compilers + Advanced Embedded System	Paper Code: RJSPCSP201 (RJSPCS201 + RJSPCS202)
Design and implementation of Modern Compilers	
1	Write a program to construct NDFA.
2	Write a program to convert the given Right Linear Grammar to Left Linear Grammar form.
3	Write a program to illustrate the generation of First, First+, Last and Last+ matrix on SPM for the input grammar.
4	Write a java code to parse a string by using SPM.
5	Write a java code for postfix evaluation.
6	Write a java code to generate 3-address code.
7	Write a code to generate the DAG for the input arithmetic expression.
8	Write a program to demonstrate loop unrolling and loop jamming for the given code sequence containing loop.
Advanced Embedded System	
1	Switching ON and OFF LED using Push button with Arduino UNO.
2	Using 7-segment display with Arduino UNO to display from 0 to 9 after specific interval of time.
3	Configuring a digital object counter device using 7-segment display with Arduino UNO and IR proximity sensor.
4	Print message on LCD display with Arduino UNO.

M.Sc Computer-Science Syllabus Semester I & II

5	Use 4 * 4 keypad to give the input in Arduino UNO serial monitor.		
6	Interfacing of buzzer with Arduino UNO.		
7	Interfacing of ultrasonic sensor with Arduino UNO.		
8	Interfacing of servo motor with Arduino UNO.		
9.	Interfacing of DHT11 with Arduino UNO to read temperature and humidity which is then printed on serial monitor.		
10	Interfacing of LED with Node MCU and controlling it remotely with Blynk application on mobile.		
<table border="1"> <tr> <td>Practical-II: Social Network analysis + Data Warehousing and Data Mining</td><td>Paper Code: RJSPCSP202 (RJSPCS203 + RJSPCS204A/B)</td></tr> </table>		Practical-II: Social Network analysis + Data Warehousing and Data Mining	Paper Code: RJSPCSP202 (RJSPCS203 + RJSPCS204A/B)
Practical-II: Social Network analysis + Data Warehousing and Data Mining	Paper Code: RJSPCSP202 (RJSPCS203 + RJSPCS204A/B)		
Social Network analysis			
1	Write a program to compute the following for a given a network: (i) number of edges, (ii) number of nodes; (iii) degree of node; (iv) node with lowest degree; (v) the adjacency list; (vi) matrix of the graph.		
2	Perform following tasks: (i) View data collection forms and/or import onemode/two-mode datasets; (ii) Basic Networks matrices transformations		
3	Compute the following node level measures: (i) Density; (ii) Degree; (iii) Reciprocity; (iv) Transitivity; (v) Centralization; (vi) Clustering.		
4	For a given network find the following: (i) Length of the shortest path from a given node to another node; (ii) the density of the graph; (iii) Draw egocentric network of node G with chosen configuration parameters.		
5	Write a program to distinguish between a network as a matrix, a network as an edge list, and a network as a sociogram (or “network graph”) using 3 distinct networks representatives of each.		
6	Write a program to exhibit structural equivalence, automatic equivalence, and regular equivalence from a network.		
7	Create sociograms for the persons-by-persons network and the committee-bycommittee network for a given relevant problem. Create one-mode network and two-node network for the same.		
8	Perform SVD analysis of a network.		
Business Intelligence and Big data Analytics			

M.Sc Computer-Science Syllabus Semester I & II

1	Write a map-reduce program to count the number of occurrences of each word in the given dataset. (A word is defined as any string of alphabetic characters appearing between non-alphabetic characters like nature's is two words. The count should be case-insensitive. If a word occurs multiple times in a line, all should be counted)
2	Write a program to implement a page rank algorithm.
3	Write a program to construct different types of k-shingles for a given document.
4	Write a program for measuring similarity among documents and detecting passages which have been reused.
5	Write a program to compute the n- moment for a given stream where n is given.
6	Write a program to demonstrate the Alon-Matias-Szegedy Algorithm for second moments.
7	Pre-process the given data set and hence apply clustering techniques like K-Means, K-Medoids. Interpret the result.
8	Pre-process the given data set and hence classify the resultant data set using tree classification techniques. Interpret the result.
9	Pre-process the given data set and hence classify the resultant data set using support vector machines. Interpret the result.
Digital Image Processing	
1	2D Linear Convolution, Circular Convolution between two 2D matrices.
2	Circular convolution expressed as linear convolution plus alias.
3	Linear cross correlation of a 2D matrix, circular correlation between two signals and linear auto correlation of a 2D matrix, linear cross correlation of a 2D matrix.
4	DFT of 4*4 gray scale image..
5	Compute discrete cosine transform, program to perform KL transform for the given 2D matrix.
6	Brightness enhancement of an image, contrast manipulation, image negative.
7	Perform threshold operation, perform gray level slicing without background
8	Image segmentation
9	Image compression
10	Binary image processing and color image processing

M.Sc Computer-Science Syllabus Semester I & II

MSc	Semester II (Practical)
RJSPCSP201 (RJSPCS201+ RJSPCS202)	Design and implementation of Modern Compilers <p>Course Outcomes:</p> <ol style="list-style-type: none"> 1. To realize basics of compiler design and apply for real time applications. 2. To introduce different translation languages . 3. To understand the importance of code optimization and generation. <p>Learning outcomes:</p> <ol style="list-style-type: none"> 1. Able to convert any instruction of a program to convert from source language to target language and should be recognize what happens at each and every phase of a compiler. 2. Student should be in a position to understand the different types of parsing techniques and should be in a position to solve the problem. 3. Student should analyze the program and minimize the code by using optimizing techniques which helps in reducing the no. of instructions in a program and also utilization of registers in an effective way. <p>Advance Embedded Systems</p> <p>Course Outcomes:</p> <ol style="list-style-type: none"> 1. To introduce the architecture of Arduino UNO. 2. To implement basic connections of input output devices. 3. To implement and test sensors. 4. To introduce Node MCU 5. To introduce programming <p>Learning outcomes:</p> <ol style="list-style-type: none"> 1. Understanding the connections of various input/ output devices like LED, 7-segment display, LCD, keypad, buzzer etc. 2. Understanding the connections of sensors like ultrasonic sensor, DHT11 sensor. 3. Understanding connections, configurations and programming of I/O devices with sensors.

M.Sc Computer-Science Syllabus Semester I & II

<p>RJSPCSP202 (RJSPCS203+ RJSPCS204A/B)</p>	<p>Social Network Analysis</p> <p>Course Outcomes:</p> <ol style="list-style-type: none"> 1. To impart practical exposure upon SNA tools <p>Learning outcomes:</p> <p>This laboratory course will prepare the students for various applications of Social Network Analysis.</p> <ol style="list-style-type: none"> 1. Understand the concepts of network models, network measures, graph representation, graph traversal algorithms, graph mining essentials. 2. Be able to analyze, and evaluate social communities. 3. Be able to use social network analysis in behavior analytics, and recommendations systems. <p>Business Intelligence and Big data Analytics</p> <p>Course outcome:</p> <ol style="list-style-type: none"> 1. Learn what Big Data is and how it is changing the world of analytics. <p>Learning outcome:</p> <ol style="list-style-type: none"> 1. Understand the motivation for and business drivers of big data analytics. 2. Learn about Hadoop, MapReduce and NoSQL as they relate to big data analytics.
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References:

1. Introduction to Algorithms, Third Edition, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, PHI Learning Pvt. Ltd-New Delhi (2009).
2. Researching Information Systems and Computing, Brinoy J Oates, Sage Publications India Pvt Ltd (2006)
3. Algorithms, Sanjoy Dasgupta, Christos H. Papadimitriou, Umesh Vazirani, McGraw-Hill Higher Education (2006)
4. Grokking Algorithms: An illustrated guide for programmers and other curious people, MEAP, Aditya Bhargava, <http://www.manning.com/bhargava>
5. Research Methodology, Methods and Techniques, Kothari, C.R., 1985, third edition, New Age International (2014) .
6. Basic of Qualitative Research (3rd Edition), Juliet Corbin & Anselm Strauss:, Sage Publications (2008).
7. Peter Bruce, Andrew Bruce, "Practical Statistics for Data Science", O'Reilly, 2017.
8. James D. Miller, "Statistics for Data Science", Packt, 2017.
9. Dr. J. Ravichandran, "Probability and Statistics for Engineers", 2010.
10. Hadley Wickham, Garrett Golemund, "R for data Science: Import, Tidy, Transform, Visualize and Model Data".
11. Prabhanjan Tatter, Tony Ojeda, Sean Patrik Murphy, Benjamin Bengfort, Abhijit Dasgupta, "Practical Data Science Cookbook", 2nd Edition, Packt, 2014.
12. "Introduction to Bio – Informatics", by T.K. Attwood and D.J. Perry –smith, Longman, Essen, 1999 .
13. Bio Informatics Computing", by Bryan Bergeron, Second Edition, Pearson Education, 2003.
14. Business Intelligence (2nd Edition), Efraim Turban, Ramesh Sharda, Dursun Delen,
 - i. David King, Pearson (2013)
15. Business Intelligence for Dummies, Swain Scheps, Wiley Publications (2008).
16. Building the Data Warehouse, Inmon: Wiley (1993).
17. Data Mining: Introductory and Advanced Topics, Dunham, Margaret H, Prentice Hall (2006).
18. Data Mining: Practical Machine Learning Tools and Techniques, Second Edition, Witten, Ian and Eibe Frank, Morgan Kaufmann (2011).

M.Sc Computer-Science Syllabus Semester I & II

19. Business Intelligence Road Map, Larissa T. Moss, Shaku Atr, Addison-Wesley
20. Data Modeling Techniques for Data Warehousing by IBM; International Technical Support Organization, Chuck Ballard, Dirk Herreman, Don Schau, Rhonda Bell, Eunsang Kim, Ann Valencic :<http://www.redbooks.ibm.com>
21. Data Mining: Concepts and Techniques, The Morgan Kaufmann Series in Data Management Systems, Han J. and Kamber M. Morgan Kaufmann Publishers, (2000).
22. Data Mining with Microsoft SQL Server 2008, MacLennan Jamie, Tang ZhaoHui and Crivat Bogdan, Wiley India Edition (2009).
23. Compilers: Principles, Techniques and Tools 2nd edition, Alfred V. Aho , Monica S. Lam , Ravi Sethi , Jeffrey D. Ullman , Pearson (2011)
24. Modern Compiler Implementation in Java, Second Edition, Andrew Appel and Jens Palsberg, Cambridge University Press (2004).
25. Principles of Compiler Design, Alfred Aho and Jeffrey D. Ullman, Addison Wesley (1997).
26. Compiler design in C, Allen Holub, Prentice Hall (1990).
27. MSP430 Microcontroller Basics by John Davies.
28. Charu C. Aggarwal, Social Network Data Analytics, Springer; 2011
29. Peter Mika, "social Networks and the semantic web springer first edition 2007
30. Exploratory Social Network Analysis with Pajek, Second edition: Wouter de, Nooy, Andrej Mrvar, Vladimir Batagelj, Cambridge University Press, 2011.
31. Analyzing Social Networks, Stephen P Borgatti, Martin G. Everett, Jeffrey C. Johnson, SAGE Publications, 2013.
32. Statistical Analysis of Network Data with R: Eric D. Kolaczyk, Gábor Csárdi, Springer, 2014.
33. Network Analysis: Methodological Foundations, (Editors) Ulrik Brandes, Thomas Erlebach. Springer, 2005.
34. Models and Methods in Social Network Analysis: (Editors) Peter J. Carrington, John Scott, Stanley Wasserman, Cambridge University Press, 2005.
35. Mining of Massive Datasets, Anand Rajaraman and Jeffrey David Ullman, Cambridge University Press, 2012.
36. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Michael Minelli, Wiley, 2013
37. Data Mining: Introductory and Advanced Topics, Margaret H. Dunham, Pearson, 2013.
38. Big Data for Dummies, J. Hurwitz, et al., Wiley, 2013

M.Sc Computer-Science Syllabus Semester I & II

39. Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data, Paul C. Zikopoulos, Chris Eaton, Dirk deRoos, Thomas Deutsch, George Lapis, McGraw-Hill, 2012.
40. Big data: The next frontier for innovation, competition, and productivity, James Manyika ,Michael Chui, Brad Brown, Jacques Bughin, Richard Dobbs, Charles Roxburgh, Angela Hung Byers, McKinsey Global Institute May 2011.
41. Big Data Glossary, Pete Warden, O'Reilly, 2011.
42. Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph, David Loshin, Morgan Kaufmann Publishers, 2013
43. Anil K.Jain, "Fundamentals of Image Processing", PHI.
44. William Pratt, "Digital Image Processing", John Wiley.
45. Milan Sonka,Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision" Thomson Learning.
46. N Ahmed & K.R. Rao, "Orthogonal Transforms for Digital Signal Processing" Springer .
47. B. Chanda, D. Dutta Majumder, "Digital Image Processing and Analysis", PHI.

M.Sc Computer-Science Syllabus Semester I & II

Scheme of Examinations

1. Two Internals of 20 marks each. Duration 30 min for each.
2. One External (Semester End Examination) of 60 marks. Duration: 2.5 hours.
3. One Practical at the end of Semester consists of Groups and each group has 2 practicals each of 50 marks but passing combined out of 100.
4. Minimum marks for passing Semester End Theory and Practical Exam is 40 %.
5. Students must appear for at least one of the two Internal Tests to be eligible for the Semester End Examination.
6. For any KT examinations, there shall be ODD-ODD/EVEN-EVEN pattern followed.
7. A candidate will be allowed to appear for the practical examinations if he/she submits a certified journal of MSc Computer-Science or a certificate from the Head of the department / Institute to the effect that the candidate has completed the practical course of M.Sc. Computer-Science as per the minimum requirements.
8. In case of loss of journal, a candidate must produce a certificate from the Head of the department /Institute that the practicals for the academic year were completed by the student. However, such a candidate will be allowed to appear for the practical examination, but the marks allotted for the journal will not be granted.
9. HOD's decision, in consultation with the Principal, shall remain final and abiding to all.

M.Sc Computer-Science Syllabus Semester I & II**Evaluation (Theory): Total marks per course - 100.****CIA- 40 marks****CIA 1: Written test -20 marks****CIA 2: Written Test / Assignment /mini project/ & Report -20 marks****Semester End Examination – 60 marks****Question paper covering all units****Evaluation of Practicals 100 marks /group (RJSPCSP101,RJSPCSP102, RJSPCSP201, RJSPCSP202)****Course Semester End Examination in Semester1 and II for Paper I to IV
(RJSPCS101 To RJSPCS104, RJSPCS201 To RJSPCS204)**

Question	KNOWLEDGE	UNDERSTANDING	APPLICATION and ANALYSIS	TOTAL MARKS- Per unit
Unit 1	07	02	03	12
Unit 2	07	02	03	12
Unit 3	07	02	03	12
Unit 4	07	02	03	12
Short notes from topics covering all the units	07	02	03	12
-TOTAL- Per objective	35	10	15	60
% WEIGHTAGE	58	17	25	100%

Evaluation of Practicals 100 marks /group (RJSPCSP101,RJSPCSP102, RJSPCSP201, RJSPCSP202)Continuous Evaluation of components which require adequate duration for completion of the task,
observation and interpretation: 25%

Course end Practical Evaluation of skills of students in terms of skill, analysis, interpretation and conclusion.

M.Sc Computer-Science Syllabus Semester I & II

Mini Project :

Dept.of _____ CourseCode _____ Date _____

UIDNo _____ RollNo _____ Marks _____

_____/10 Name of student: _____

Title of Assignment: _____

Assessment Grid :Place one tick in each appropriate row. Overall mark should reflect the positions of ticks in the individual rows. In boxes that have more than one set of marks, cancel out the marks that are not applicable and circle the correct marks.

Project work and report (Parameters)	Marks	80 – 100% Excellent	60 -80% Good	40 – 60% Satisfactory	20 – 40% Average
Project work done	10	10 / 9	8 / 7	6 / 5	4 / 3

M.Sc Computer-Science Syllabus Semester I & II**COMPUTER SCIENCE****Mapping of the courses to employability / entrepreneurship / skill development**

Class	Course Name	Course Code	Unit No. And topics focusing on Employability / Entrepreneurship / Skill development	Employability / Entrepreneurship / Skill development
MSC SEM I				
MSC	Analysis of Algorithms and Researching Computing	RJSPGCS101	Employability Unit 1 : Divide-and-Conquer , Probabilistic Analysis and Randomized Algorithms Unit 2 : Heap sort, Sorting in Linear Time, Medians and Order Statistics, All-Pairs Shortest Paths Unit 3 : Multithreaded Algorithms, Linear Programming, Number-Theoretic Algorithms, Approximation Algorithms Unit 4 : purpose and products of research, Quantitative data analysis, presentation of research.	Employability in the field of system design & researching
MSC	Fundamental of Data Science	RJSPGCS102	Employability Unit 1 : Business Analytics, Popular Data Science Technique Unit 2 : Probability, Probability, Probability Unit 3 : Discrete & Continuous Distributions Unit 4 : Histogram, Histogram, Hypothesis Testing	Employability in the field of Data Scientist, data engineer
MSC	Bio-Informatics	RJSPGCS103	Employability Unit 2 : Biological Databases Unit 3 : Sequence Analysis Unit 4 : Structure Prediction	Employability in the field of bio-informatics & researching
MSC	Data Warehousing & Data Mining	RJSPGCS104	Employability Unit 1 : Business Intelligence Unit 2 : Business Data Warehouse Unit 3 : Designing Business Data Warehouse Unit 4 : Data Mining	Employability in the field of big data management
MSC SEM II				

M.Sc Computer-Science Syllabus Semester I & II

MSC	Design And Implementation of Modern Compilers	RJSPGCS201	Employability Unit 2 : Automatic Construction of Efficient Parsers Unit 3 : Advanced syntax analysis and basic semantic analysis Unit 4 : Dataflow analysis and loop optimization	Employability in the field of compiler design
MSC	Advance Embedded Systems	RJSPGCS202	Employability Unit 1 : Embedded Electronic Systems & Microcontrollers, Instruments & Development MSP430 Unit 2 : Architecture of MSP430 processor, Functions, Interrupts & low power modes Unit 3 : Digital Input, Output, Displays, Timers Unit 4 : Analog Input/output, Communication	Employability in the field of embedded & IOT system design
MSC	Social Network Analysis	RJSPGCS203	Employability Unit 2 : Visualization and application of social network Unit 3 : Mining Communities, Predicting Human Behavior and Privacy Issues Unit 4 : Measures of similarity and structural equivalence in SNA, Two-mode networks for SNA	Employability in the field of social networking
MSC	Business Intelligence & Big Data Analytics	RJSPGCS204	Entrepreneurship Unit 2 : Hadoop Ecosystem and its components Unit 3 : Shingling of documents Unit 4 : MINING DATA STREAMS	Employability in the field of big data analytics

Comments:

Name and Signature of Faculty_.

Mini Project Post graduate level

Dept.of_____CourseCode_____Date_____

UIDNo_____RollNo_____Marks

_____/20 Name of student: _____

M.Sc Computer-Science Syllabus Semester I & II

Title of Assignment:

Assessment Grid :Place one tick in each appropriate row. Overall mark should reflect the positions of ticks in the individual rows. In boxes that have more than one set of marks, cancel out the marks that are not applicable and circle the correctmarks.

Project work and report (Parameters)	Marks	80 – 100% Excellent	60 -80% Good	40 – 60% Satisfactory	20 – 40% Average
Project work done	10	10 / 9	8 / 7	6 / 5	4 / 3
Report writing and conclusions	10	10 / 9	8 / 7	6 / 5	4 / 3

M.Sc Computer-Science Syllabus Semester I & II