MCA SEMESTER IV

MCA SEMESTER – IV					
Code	**Title**	**Marks of ESE**	**Marks of CIA**	**Credit**	**Total Marks**
EC-1	Minor Project	70	30	4	100
EC-2	Major Project	70	30	10	100
DSE-1	Discipline Specific Elective	70	30	5	100
		Total		**19**	**300**

CSC – Core Courses
AECC – Ability Enhancement Compulsory Courses
AEC – Ability Enhancement Courses
EC – Elective Courses
DSE – Discipline Specific Elective

List of Ability Enhancement Courses:	**List of Discipline Specific Elective:**
• Computer and IT Skills • Web Designing • Numerical Analysis • Operation Research • Financial Accounting • Organization Behavior • Discrete Mathematics • Computer Graphics • Python Programming • Others	• Parallel & Distributed Computing • Cyber Security • Cryptography • Quantum Computing • Machine Learning and Soft Computing • Digital Image Processing & Multimedia • Big Data Analysis • Cloud Computing • Compiler Design • Data warehousing and Data Mining • Android Studio • IOT Development

MCA Semester – IV

EC-1	Minor Project	Credit: 4

Each student will be assigned some project work at the starting of the fourth semester. Each student (or group of at most 2 students) is expected to take a unique problem under the guidance/supervision of a faculty member of the department.

The problem should be such that the students get a chance to explore one or two technologies in depth and grab good command over those technologies after successful completion of the project. Repetition of the problems already attempted by students of the previous years should not be encouraged unless the problem has exceptionally great research importance and scope. Application problems, if found interesting and arisen at the demand of a particular situation, may also be assigned; but typical information management systems with just two or three simple

database tables and/or dataentry forms are to be discouraged. The project may be done in other Institutes/Organizations with prior permission from the concerned department of the College and in this case also one project supervisor should have to be from the concerned department in the College. The work will have to be submitted in the form of a dissertation. Project presentation and evaluation will have to be done as per the regulation of PG course semester system of G.U. with choice based credit and grading system.

EC-2	Major Project & Dissertation	Credit: 10

This is an industrial project. Each student has to complete the industrial training for at least 3 months. The project is evaluated by internal and external examiners. It may include dissertation, seminar, viva voce etc.

DSE-1	Discipline Specific Elective	Credit: 5

Parallel & Distributed Computing

Unit-1. Introduction: Need for Computational speed; Applications of parallel computers in various fields including Mathematics, Physics, Chemistry and Computer Science; Configuration of some existing Mainframe and Super Computers for parallel processing; issues in parallel processing.

Unit-2. Parallel Processing Architectures: Parallelism in Sequential Machines, Abstract model of parallel computer, multiprocessor architecture, programmability issues.

Unit-3. Data Dependency Analysis: Introduction, Types of Dependencies, Loop and Array Dependence, Loop Dependence Analysis, Solving Diophantine Equations.

Unit-4. Shared Memory Programming: General Model, Process Model under UNIX, Thread Management, Thread Implementation.

Unit-5.Distributed Computing: Message passing model, Parallel Virtual Machine (PVM), Remote procedure call.

Unit-6. Algorithms for Parallel Machines: Speedup, Complexity and Cost, Parallel Reduction. Quadrature Problem, Matrix Multiplication, Parallel Sorting Algorithms and Solving Linear System, Parallel Programming Languages:Fortran 90, nCUBE C, Occam, C-Linda.

Reference Books:

1. Sasikumar, Shikhara,Dinesh and Prakash, Introduction to Parallel Processing, PHI..
2. Rajaraman, Elements of Parallel Computing, PHI.
3. Susann, Parallel Programming, TMH.

Digital Image Processing & Multimedia

Unit-1. Introduction and Fundamental to Digital Image Processing: What is Digital Image Processing, Origin of Digital Image Processing, Examples that use Digital Image Processing, Fundamental steps in Digital Image Processing, Components of Digital Image Processing System, Image sensing and acquisition, Image sampling, quantization and representation, Basic relationship between pixels.

Unit-2. Image Enhancement: Image Enhancement in the Spatial Domain & Frequency domain: Background, Basic gray level transformation, Histogram processing, Basics of spatial filtering, Smoothing and Sharpening Spatial filters, Introduction to Fourier Transform and the Frequency Domain, Discrete Fourier Transform. Smoothing and Sharpening Frequency-Domain filters.

Unit-3. Image Restoration: Image Degradation/Restoration Process, Noise models, Restoration in presence of noise, Inverse Filtering, Minimum Mean Square Filtering, Geometric mean filter, Geometric transformations. Color Image Processing: Color Fundamentals, Color models, Basis of full color image processing, Color transformations.

Unit-4. Image Compression: Fundamentals, Image compression models, Error free compression, Lossy compression.

Unit-5. Image Segmentation and Representation: Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation. Representation, Description and Recognition: Representation-chain codes, polygonal approximation and skeletons, Boundary descriptors-simple descriptors, shape numbers, Regional descriptors-simple, topological descriptors, Pattern and Pattern classes-Recognition based on matching techniques.

Reference Books:

1. Sridhar, Digital Image Processing, OUP.
2. Gonzalez& Wood, Digital Image Processing, PE.
3. Jain, Digital Image Processing, PHI.
4. William K Pratt, Digital Image Processing, John Willey.

Big Data Analysis

Unit-1. Introduction To Big Data: Introduction to Big Data, Challenges of Big Data, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting, Modern Data Analytic Tools, Statistical Concepts: Sampling Distributions, Statistical Inference, Prediction Error.

Unit-2. Mining Data Streams: 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, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform(RTAP) Applications.

Unit-3.Hadoop: History of Hadoop, The Hadoop Distributed File System, Components of Hadoop, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Map Reduce Introduction, Map Reduce Features, How Map Reduce Works, Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort, Task execution, Map Reduce Types and Formats. Hadoop Environment: Setting up a Hadoop Cluster, Cluster specification, Cluster Setup and Installation, Hadoop Configuration, Security in Hadoop, Hadoop in the cloud.

Unit-4. HIVE AND HIVEQL, HBASE: Introduction to No Query Language, Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting And Aggregating, Map Reduce Scripts, Joins &Subqueries, HBaseconceptsAdvanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.

Reference Books:

1. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", TMH.
2. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons.
3. Pete Warden, "Big Data Glossary", O'Reilly.

Cloud Computing

Unit-1. Cloud Computing Fundamentals: Cloud Computing definition: private, public and hybrid cloud; Evolution of Cloud Computing; Characteristics of Cloud, Cloud Types; Cloud Computing Benefits and Limitations, Cloud Architecture; Cloud computing vs. Cluster computing vs. Grid computing; Applications: Technologies and Process required when deploying Web services; Deploying a web service from inside and Outside of a Cloud.

Unit-2. Cloud Computing service models: Introduction to Cloud Services: : SaaS, IaaS, PaaS; Storage As a Service, Communication As a Service; Cloud-based big data/real time analytics, Understanding SOA; Improving Performance through Load Balancing. Virtualization Basics: Objectives, Benefits of Virtualization, Emulation, Virtualization for Enterprise, VMware, Server Virtualization, Data Storage Virtualization.

Unit-3.Cloud vendors and Service Management: Amazon cloud, AWS Overview, Installation of AWS, Google app engine, azure cloud, salesforce. Service Management in Cloud Computing: Service Level Agreements(SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously , Managing Data:Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud , Large Scale Data Processing.

Unit-4. Security Concepts: Cloud security challenges, Cloud security approaches: encryption, tokenization/obfuscation, cloud security alliance standards, cloud security models and related patterns, Cloud security in mainstream vendor solutions, Mainstream Cloud security offerings: security assessment, secure Cloud architecture design, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations. Case Study on Open Source & Commercial Clouds: Eucalyptus, Microsoft Azure, Amazon EC2.

Reference Books:

1. Cloud Computing : A Practical Approach by Anthony T. Velte Toby J. Velte, Robert Elsenpeter, TMH.
2. Cloud Computing Bible, Barrie Sosinsky, Wiley-India.
3. Cloud Computing: Principles and Paradigms, Editors: RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Wiley-India.

Compiler Design

Unit-1. Introduction to Compilation: Compilers and phases of compilation, analysis-synthesis model of translation, compiler construction tools.

Unit-2. Lexical Analysis: Process of lexical analysis, finite state automata, DFA and NFA, recognition of regular expressions, LEX.

Unit-3. Syntax Analysis: Process of syntax analysis, types of grammar, top-down and bottom-up parsing techniques, parser generator. Overview of syntax directed translation scheme.

Unit-4. Intermediate Code Generation: Intermediate languages, generating intermediate code for declarative statement, assignment statement, Boolean expression, and case statement.

Unit-5. Code Optimization: Introduction to code optimization, potential cases of code optimization, optimization of basic blocks, loops in flow graphs, code improving transformation.

Unit-6. Code Generation : Issues in the design of a code generator, the target machine, dynamic storage management, translating basic blocks, a simple code generator, peephole optimization, directed acyclic graphs and basic blocks, code generation from directed acyclic graphs.

Reference Books:

1. Muneeswaran, Compiler Design, OUP.
2. Aho, Ullman, &Sethi, Compilers : Principles, Techniques & Tools, Addison Wesley.
3. HenkAlblas et al., Practice & Principles of Compiler Building with C, PHI.
4. Trembley& Sorenson, Principles of Compiler Design, TMH.

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