

**MASTER OF COMPUTER APPLICATIONS [MCA]****REVISED SCHEME OF EXAMINATION  
REGULAR PROGRAMME****FIFTH SEMESTER**

Paper Code	Paper Title	L	P	Credit
<b>THEORY</b>				
MCA-301	Advanced Database Management Systems	4	0	4
MCA-303	Software Testing & Quality Management	4	0	4
MCA-305	Big Data & Business Analysis	4	0	4
<b>Elective - I (Choose any One)</b>				
MCA-307	Numerical and Scientific Computing	4	0	4
MCA-309	Mobile Computing			
MCA-311	Artificial Intelligence			
MCA-313	Microprocessors			
MCA-315	Compiler Design			
MCA-317	Software Project Management			
MTIT-713	E-Commerce and M-Commerce			
<b>Elective - II (Choose any One)</b>				
MCA-319	Distributed Systems and Parallel Processing	4	0	4
MCA-321	Organizational Behavior			
MCA-323	Advanced Computer Architecture			
MCA-325	Digital Signal Processing			
MCA-327	Soft Computing			
MCA-329	Emerging Trends			
MTCS-601	Mobile Architecture and Programming			
<b>PRACTICALS</b>				
MCA-351	Advanced Database Management Systems Lab	0	2	1
MCA-353	Software Testing & Quality Management Lab	0	2	1
MCA-355	Big Data & Business Analysis Lab	0	2	1
MCA-357	Lab based on Elective - I & II	0	2	1
MCA-361	Term Paper*	-	2	1
	<b>TOTAL</b>	<b>20</b>	<b>10</b>	<b>25</b>

\* Non-University Examination System (NUES)

**MASTER OF COMPUTER APPLICATIONS [MCA]  
REVISED SCHEME OF EXAMINATION  
REGULAR PROGRAMME**

**SIXTH SEMESTER**

Paper Code	Paper Title	L	P	Credit
MCA-302	Dissertation	-	-	26
MCA-362	Seminar and Progress Report*	-	-	4
	<b>TOTAL</b>	-	-	<b>30</b>

\*: Non-University Examination System (NUES)

The total number of credits of the MCA Programme. = 155.

Each student shall be required to appear for examination in all courses. However, for the award of the degree a student shall be required to earn a minimum of 150.

**Paper Code: MCA-301**

**Paper: Advanced Database Management Systems**

**L P C**  
**4 0 4**

**INSTRUCTIONS TO PAPER SETTERS: Max. Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks.

**UNIT - I**

**Review:** Traditional DBMS's, Relational Model and its difficulties, Need for complex data types.

**Object Relational Systems:** Objects, OIDs and reference types, Storing objects in Relational Databases.

**Object Oriented databases:** Approaches, Modeling and Design, Persistence and by naming convention, Query Languages (ODMG data model and OQL), Transaction, Concurrency, Multi Version Locks, Recovery.

Comparing RDBMS, OODBMS and ORDBMS.

**[10 Hrs]**

**UNIT - II**

**Query Processing:** Measures of Query cost, Selection Operation, Sorting, Join operation, Evaluation of expressions, Query Optimization, transformation of Relational Expressions, Choice of evaluation plans, Materialized Views.

**Client Server architecture:** Principles, Components, Drawbacks and its advantages; ODBC, ADO, JDBC and JSQL overview, Databases architecture, N-tier Architecture.

**[10 Hrs]**

**UNIT - III**

**Distributed Databases:** Homogeneous & Heterogeneous Databases, Distributed Vs Conventional database, Distributed query processing and query transformation, Simple join processing, Distributed Transactions and their commit protocols, Concurrency Control in Distributed Data Bases;

**[10 Hrs]**

**UNIT - IV**

**XML Databases:** XML Data Model, DTD - XML Schema, XML Querying.

**Web Databases:** Web and semi structured data, search engines.

**Multimedia databases:** Search for non tabular data such as text, image, video, audio.

Mobile database, Temporal Database, Spatial Data management, Introduction to Big Data.

**[10 Hrs]**

### **TEXT BOOKS:**

1. Silberchatz, Korth, Sudershan, "Database System Concepts", Tata MC Graw Hills Publishing, 5th Edition, 2005.
2. Ramez Elmasri & Shamkant Navathe, "Database Management Systems", Pearson Education Asia, 6th Edition, 2010.
3. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill, 3<sup>rd</sup> Edition 2004.

### **REFERENCE BOOKS:**

1. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, R.T.Snodgrass, V.S.Subrahmanian, "Advanced Database Systems", Morgan Kaufman Series, 1997.
2. C. J. Date, "Introduction to Database Systems", AWL, 8<sup>th</sup> Edition.
3. T. J. Teorey, "Database Modeling and Design", Morgan Kaufman Series, 5<sup>th</sup> Edition, 2011.
4. C.S.R Prabhu, "Object-Oriented Database Systems", Prentice Hall Of India, 1998.
5. N.Tamer Ozsu, Patrick Valduriez, "Principles of Distributed Database Systems", Prentice Hal International Inc., 1999.

Paper Code: MCA-303

Paper: Software Testing & Quality Management

L P C  
4 0 4

**INSTRUCTIONS TO PAPER SETTERS:** Max. Marks: 60

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks.

**UNIT - I**

**SQA Concepts:** Basic notions- Quality Assurance, errors/ defect, fault, failure, Defect detection, Defect Reduction vs. Defect Prevention, Defect Avoidance, Classification of the causes of software errors, Definitions- Software Quality, Software Quality Assurance Software Quality Control, the objectives of SQA activities, SQA Players, Role of SQA Group.

**Testing Concepts:** Testing as an Engineering Activity: Role of Process in Software Quality, Testing as a Process, Why should we test? , Who should do the testing? , What should we test? Overview of Testing Maturity Model? Software Testing Principles, Tester's Role in a Software Development Organization.

[10 Hrs]

**UNIT - II**

**Strategies and Methods for Test Case Design-** Test Plans - Goals, strategies and techniques, Test Case Design Strategies, Using Black Box Approach to Test Case Design, Boundary value analysis, and Equivalence class testing Decision Table-based Testing.

**Using White Box Approach Techniques-** Test Adequacy Criteria, Unit Testing, Coverage and Control Flow Graphs, Control flow testing, Data flow testing, Slice based testing and mutation testing.

[10 Hrs]

**UNIT - III**

**System Testing-** Integration Testing, Acceptance Testing, Performance Testing, Load Testing, Stress Testing, Security testing and Recovery testing

**Software Verification-** Verification Methods, Software Document Verification, Creating Test Cases from Requirements and Use Cases, Selection, Minimization and Prioritization of Test Cases for Regression Testing

[10 Hrs]

**UNIT - IV**

**Test Metrics:** What should we Measure During Testing, Software Metrics, Categories of Metrics, Object Oriented Metrics Used in Testing

**Quality Assurance beyond Testing:** Defect Analysis, Defect Prevention and Process Improvement, Root Cause Analysis, Quality Models and Measurement.

[10 Hrs]

### **TEXT BOOKS:**

1. Yogesh Singh, "Software Testing", Cambridge University Press, 2011.
2. Stephen H Kan, "Metrics and Models in Software Quality Engineering", Pearson Education, New Delhi, 2002.

### **REFERENCE BOOKS:**

1. Paul C Jorgensen, "Software Testing – A craftsman Approach", 4<sup>th</sup> Edition, CRC Press, 2013.
2. Milind Limaye, "Software Quality Assurance, McGraw-Hill Publication, 2007.
3. Kasseem A. Saleh, "Software Engineering", Cengage Learning, 2009.

Paper Code: MCA-305

L P C

Paper Title: Big Data and Business Analysis

4 0 4

**INSTRUCTIONS TO PAPER SETTERS:** Max. Marks: 60

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks.

**UNIT -I**

**Introduction to Big Data:** Big data management, Characteristics of Big data, Importance of Big data, Big data use cases, Big data and business, building the Big data team, sources for Big data, security, compliance, auditing and protection, evolution, best practices for analysis of Big data, concepts of OLAP and RTAP, data exploration- data visualization, multidimensional visualization, specialized visualization, data summaries, correlation analysis, reducing the number of categories, principle component analysis, dimension reduction using regression models, dimension reduction using classification and regression trees.

[10 Hrs]

**UNIT -II**

**Prediction and classification methods-** Multiple linear regression, introduction, explanatory versus predictive modeling, estimating the regression equation and prediction, variable selection in linear regression; KNN classifier, KNN for a numerical response business case studies for data classification, K-mean Clustering, Bradley-Fayyad-Reina algorithm, Fuzzy C -means Clustering.

[10 Hrs]

**UNIT -III**

**Decision making process in big data-** Different decision aiding processes, decision support systems, decision support system framework, building decision support systems, DSS benefits, limitations and risks, analysing business decision processes- managerial decisions, decision making context, decision making processes, redesigning decision processes, networking issues in DSS, improving security, business intelligence and decision making, competitive business intelligence. **Social Network Analysis**-Social Networks, Blogs & Micro blogs, Sentiment Analysis and opinion mining.

[10 Hrs]

**UNIT -IV**

**Big Data Analytics tools:** Map Reduce, Hadoop, NoSQL, Gephi, CASE STUDIES for Business Intelligence, Web Data, Web communities; Crawlers, Document Summarization technique, CASE STUDIES for Business Intelligence.

[10 Hrs]

### **TEXT BOOKS:**

1. Shmueli, Patel & Bruce, "Data Mining for Business Intelligence", Wiley Interscience Publications, 2<sup>nd</sup> Edition, 2010.
2. EG Mallach, "Decision Support Systems & Data warehousing Systems", Tata McGraw Hill Publications, 1<sup>st</sup> Edition, 2002.
3. Alex Berson & S J Smith, "Data Warehousing, Data Mining & OLAP", Tata Mc Graw Hill Publishing Company, 1<sup>st</sup> Edition, 2004.

### **REFERENCE BOOKS:**

1. R Roiger & M Geatz, "Data Mining – A Tutorial Based Primer", Pearson Education Asia, 2<sup>nd</sup> edition, 2002.
2. J.C. Lee, "Social Networks Analysis", Springer Publications.

**Paper Code: MCA-307**

**Paper: Numerical and Scientific Computing**

**L P C**  
**4 0 4**

**INSTRUCTIONS TO PAPER SETTERS: Max. Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks.

**UNIT - I**

**Introduction:** Taylor Series, Number Representation and Errors, Representation of Numbers in Different Bases, Floating-Point Representation, Loss of Significance.

**Locating Roots of Equations:** Bisection Method, Newton's Method, Secant Method Interpolation and Numerical Differentiation, Polynomial Interpolation, Errors in Polynomial Interpolation, Estimating Derivatives and Richardson Extrapolation

**Numerical Integration:** Definite Integral, Trapezoid Rule, Romberg Algorithm, More on Numerical Integration, An Adaptive Simpson's Scheme, Gaussian Quadrature Formulas

[10 Hrs]

**UNIT - II**

**Ordinary Differential Equations:** Initial-Value Problem, Analytical vs. Numerical Solution, Taylor Series Methods, Runge-Kutta Methods, Stability, Adaptive Runge-Kutta Methods, and Multistep Methods

**Systems of Ordinary Differential Equations:** Methods for First-Order Systems, Higher-Order Equations and Systems, Adams-Moulton Methods, Adam-Basforth Method

**Systems of Linear Equations:** Naive Gaussian Elimination, Gaussian Elimination with Scaled Partial Pivoting, Tridiagonal and Banded Systems, LU Factorizations, Iterative Solution of Linear Systems, Eigenvalues and Eigenvectors, Power Method

[10 Hrs]

**UNIT - III**

**Approximation by Spline Functions:** First-Degree and Second-Degree Splines, Natural Cubic Splines, B Splines; Interpolation and Approximation by B Splines

**Smoothing of Data and the Method of Least Squares:** The Method of Least Squares, Orthogonal Systems and Chebyshev Polynomials, Other Examples of the Least Squares Principle Monte Carlo Methods and Simulation, Boundary Value Problems for Ordinary Differential Equations, Shooting Method, Discretization Method, Partial Differential Equations, Some Partial Differential Equations from Applied Problems, Parabolic Problems, Hyperbolic Problems, Elliptic Problems

[10 Hrs]

## **UNIT - IV**

**Minimization of Multivariate Functions:** Unconstrained and Constrained Minimization Problems, One-Variable Case, Multivariate Case,

**Linear Programming:** Standard Forms and Duality, Simplex Method, Approximate Solution of Inconsistent Linear Systems

**Tools: MATLAB environment:** Matrix computation, Planar Plots, 3-d mesh, output format, Function files, relation and function loops

[10 Hrs]

### **TEXT BOOKS:**

1. Ward Cheney and David Kincaid, "Numerical Mathematics & Computing", 5<sup>th</sup> Edition, Brooks/Cole, 6<sup>th</sup> edition, 2004.
2. M. K. Jain, S.R.K. Iyengar, R. K. Jain, "Numerical Methods for Scientific and Engineering Computation", New Age International Publications, 2005.

### **REFERENCE BOOKS:**

- 1 B.H.Flowers, "An Introduction to Numerical Methods in C++", Oxford University Press, 2000.
- 2 Timothy Sauer, "Numerical Analysis", Pearson Education, 2012
- 3 William H. Press, Saul A. Teukolsky, William T. Vetterling, Brian P. Flannery, "Numerical Recipes - The Art of Scientific Computing Hardcover", 3<sup>rd</sup> Edition 2007.

**Paper Code: MCA-309**  
**Paper: Mobile Computing**

**L P C**  
**4 0 4**

**INSTRUCTIONS TO PAPER SETTERS:** **Max. Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks.

**UNIT - I**

**Cellular Mobile Wireless Networks:** Systems and Design Fundamentals, Propagation Models Description of Cellular system, Frequency Reuse, Co channel and Adjacent channel interference, Propagation Models for Wireless Networks,

**Communication System – Generations** - First, Second (2G and 2.5G), Third, WLANs, All-IP Network: Vision for 4G.

**[10 Hrs]**

**UNIT – II**

**Data management issues:** mobility, wireless communication and portability, data replication Schemes, basic concept of Multi Hopping, Adaptive Clustering for mobile Network, Multi cluster Architecture.

**[10 Hrs]**

**UNIT – III**

**Location Management:** Introduction, Location Based Services, Automatically Locating Mobile Users, Locating and Organizing Services, Is Use and future directions, mobile IP, Comparison of TCP wireless.

**[10 Hrs]**

**UNIT - IV**

**Transaction management:** Introduction, Data Dissemination, Cache Consistency, Mobile transaction processing, mobile database research directions, Security fault tolerance for mobile N/W.

**[10 Hrs]**

**TEXT BOOKS:**

1. Schiller, "Mobile Communications", Pearson Publications, 2<sup>nd</sup> Edition, 2003.
2. Shambhu Upadhyaya, Abhjeet Chaudhary, Keviven Kwiat, Mark Weises, "Mobile Computing", New Age International Publishers, 2014.

**REFERENCEBOOKS:**

1. C. K. Toh, "Mobile Adhoc Networks", Prentice Hall, 2002.
2. SipraDasBit, Biplob K. Sikdar, "Mobile Computing, PHI, 2009.

**INSTRUCTIONS TO PAPER SETTERS:** **Max. Marks: 60**

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**UNIT – I**

**Introduction:** Definitions of AI, Weak vs Strong AI, Applications of AI, Concept of Intelligent Agent – Agents & Environment, Good Behavior, Nature of Environments & Structure of Agents. **Problem Solving (Informed and Uninformed Search):** Problem Solving Agents – Formulating Problems & Performance Measurement, Uninformed Search Techniques - Breadth first search, Depth first search, Depth limited & Bidirectional search, Informed Search Techniques - Hill climbing, Best-first search, Branch and bound, A\* and AO\* algorithm, Problem Reduction, Backtracking search for Constraint Satisfaction, Means-End Analysis.

[10 Hrs]

**UNIT – II**

**Adversarial Search (Game Playing):** Game Tree, Minimax Algorithm, Alpha Beta Pruning. **Knowledge and Reasoning:** Logical Agents, Propositional Logic – Knowledge Base, Inference, Reasoning Patterns, Resolution & Chaining, Predicate Logic – Universal & Existential quantification, Applying predicate logic, Unification, Resolution, Forward Chaining, Backward Chaining, Declarative and Procedural Representation. **Structured Knowledge Representation:** Ontological Engineering, Semantic Nets - Slots, exceptions and default frames, conceptual dependency, scripts.

[10 Hrs]

**UNIT – III**

**Handling Uncertainty:** Probability Notion, Axioms of Probability, Non-Monotonic Reasoning, Probabilistic reasoning, Use of certainty factors, Fuzzy logic. **Learning:** Forms of learning, Inductive Learning, Decision Trees, Statistical Learning – Learning with Complete Data (Naïve Bayes), Learning with Hidden Variables (Clustering), Instance based learning (Nearest Neighbor) & Neural Networks, Genetic Algorithms.

[10 Hrs]

## UNIT – IV

**Natural Language Processing:** Introduction, Syntactic Processing, Semantic Processing, Pragmatic Processing, Information Retrieval & Extraction, Machine Translation.

**Expert Systems:** Overview – Characteristics & Design, Types of Expert Systems - MYCIN, Dendral, Knowledge acquisition.

**Artificial Intelligence:** Present and Future

[10 Hrs]

### **TEXT BOOKS:**

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson, 2<sup>nd</sup> Edition, 2009.
2. E. Rich and K. Knight, "Artificial Intelligence", TMH, 2<sup>nd</sup> Ed., 1992.
3. Ela Kumar, "Artificial Intelligence", I. K. International Publishing House, 2011.

### **REFERENCE BOOKS:**

1. P. H. Winston, "Artificial Intelligence", Pearson Education, 3rd Edition, 2002.
2. D. W. Patterson, "Introduction to AI and Expert Systems", PHI, 1992.
3. R. J. Schalkoff, "Artificial Intelligence – An Engineering Approach", McGraw Hill Int. Ed. Singapore, 1992.
4. M. Sasikumar, S. Ramani, "Rule Based Expert Systems", Narosa Publishing House, 1994.
5. Tim Johns, "Artificial Intelligence, Application Programming", Wiley Dreamtech, 2005.

**INSTRUCTIONS TO PAPER SETTERS:** Max. Marks: 60

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**UNIT – I**

Computer Number Systems, Codes, and Digital Devices: Computer Number Systems and Codes, Microprocessor Evolution and Types, the 8086 microprocessor family-overview, 8086 internal architecture, introduction to programming the 8086; addressing modes of 8086.8086 Family Assembly Language Programming: Program Development Steps, Constructing the machine codes for 8086 instructions, writing programs for use with an assembler, assembly language program development tools.

[10 Hrs]

**UNIT – II**

Implementing Standard Program Structures in 8086 Assembly Language: Simple Sequence Programs, Jumps, Flags, and Conditional Jumps, If-Then, if-then-else, and multiple if-then else programs, while-do programs, while-do programs, repeat-until programs, instruction timing and delay loops. Strings, Procedures, and macros: the 8086 string instructions, writing and using procedures; writing and using assembler macros 8086 Instruction Descriptions and Assembler Directives.

[10 Hrs]

**UNIT – III**

8086 System Connections, Timing, and Troubleshooting: A basic 8086-microcomputer System, An example Minimum-mode System, the SDK-86, Troubleshooting a simple 8086- based microcomputer, Timing Diagrams 8086 Interrupts and Interrupt Applications: 8086 interrupts and Interrupt Responses, Hardware Interrupt Applications.

[10 Hrs]

**UNIT – IV**

Interfacing 8086 with 8255, 8254, 8259, 8253, 8251, 8259, 8279. Brief Introduction to Architecture of 80186, 80286, 80386, 80486, 8087 and Pentium architecture.

[10 Hrs]

### **TEXT BOOKS:**

1. D. V. Hall, "Microprocessors and Interfacing", TMH, 2<sup>nd</sup> Ed., 1999
2. Barry B, "The Intel Microprocessors Architecture, Programming and Interfacing", Pearson, 8<sup>th</sup> Ed., 2009.
3. John Uffenbeck, "The 8086 / 8088 Family Design Programming and Interfacing", PHI, 2009.

### **REFERENCE BOOKS:**

1. Peter Able, "IBM PC Assembly Language Programming", PHI, 1994.
2. James. L. Antonaks, "An Introduction to the Intel Family of Microprocessors", Addison Wesley, 1999.
3. Liu Gibson, "Microprocessor Systems: The 8086/8088 Family Architecture, Programming & Design", PHI, 1999.
4. Walter A. Triebel, Avtar Singh, "Programming Interfacing Software Hardware and Applications", Pearson, 4<sup>th</sup> Ed., 2009.
5. Frank Tsui, Orlando Karan, "Essentials of Software Engineering", Jones and Bartletts, 2<sup>nd</sup>. Ed., 2010.

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1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks.

**UNIT - I**

**Introduction** – Basic concepts of Compilers, Interpreters, Assemblers, Macros, Loaders and Linkers. The Analysis-Synthesis model of a compiler, Phases of compiler. Symbol Table. Applications of compiler. Front end and back end. Tools for compiler construction.

**Lexical Analysis phase**- Role of the lexical analyser, specifications of a lexical analyser. tokens, recognition of tokens, patterns and lexemes. regular expressions, regular grammar, transition diagram, error reporting, difficulties associated with lexical analysis, the lexical analyser generator (LEX) , design of LEX

[10 Hrs]

**UNIT - II**

**Syntax Analysis** - Role of parser, error recovery in parsing, context free grammar. Top down parsing techniques, recursive descent parsing, predictive parsing. Bottom up parsing techniques, shift reduce parsing, operator precedence parsing, LR parsers(SLR, LALR and CLR), handling ambiguous grammars, conflicts of LR parsers, viable prefixes, Grammars-LL(1), LR(0), LR(1), SLR(1) and LALR, Construction of SLR, LALR and CLR parsing tables. Comparison of parsing methods. Parser generators YACC and BISON.

[10 Hrs]

**UNIT-III**

**Semantic analysis**- Syntax directed translation, Syntax directed definition, inherited and synthesized attributes, S-attributed and L-attributed grammar, dependency graph, evaluation order, top down and bottom up translation, application of syntax directed translations. Type checking- specifications of a type checker.

**Symbol Table**- Structure of a symbol table, attributes and management of symbol table. Run time environment- storage organisation (static and dynamic), stack and heap storage allocation.

**Intermediate code generation**- Intermediate representations, translations of declarations, assignments, three address code, syntax tree, back-patching

[10 Hrs]

## **UNIT - IV**

**Error handling:** Types of errors, Error detection, Error recovery.  
**Code generation-** Issues. Basic blocks and flow graphs. Register allocation. DAG representation of programs, code generation from DAG.

**Code Optimisation**-Optimisation of basic blocks. Peephole optimisation. Machine independent optimisation. Dead code elimination. Constant folding, copy propagation, code motion, induction variables.

**[10 Hrs]**

### **TEXT BOOKS:**

1. Ravi Sethi and Jeffrey, "Compilers Principles, Techniques and Tools", D. Ullman, Pearson, 1998.
2. K. C. Louden, "Compiler Construction, Principle and Practice", Cengage Publication 6<sup>th</sup>Ed. , 2009.
3. Alfred V. Aho, V.Raghvan, "Principles of compiler Design", TMH, 2009.
4. Levine, Mason and Brown, "Lex&Yacc", O' Reilly, 1998.

### **REFERENCE BOOKS:**

1. S. S. Muchnick Harcourt Asra, "Advanced Compiler Design implementation", Morgan Kaufman, 2006.
2. Allen, "Modern Compiler Implementation in C", Cambridge University Press, 1997.
3. Alan I. Holub, "Compiler Design in C", PHI, 2009.
4. VinuV. Das, "Compiler Design using FLEX and YACC", PHI, 2005.
5. Cooper, "Engineering a Compiler", Elsevier, 2005.
6. Fisher, "Crafting a Compiler in C", Pearson 2005.

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**UNIT - I**

**Introduction:** Introduction to software project management Activities, Attributes of a Project, Project Life Cycle, The project Management Process, Project Selection.

Preparing a request for Proposal, Soliciting Proposals, Proposal Preparation, Pricing Considerations, Proposal Submission and follow up, Customer Evaluation of Proposals.

[10 Hrs]

**UNIT - II**

**Project Management Organizational Structures** - Functional Type Organization, Project Type Organizations, Matrix-Type Organization, Project Planning - Project Objective, Work Breakdown Structure, Developing the Network Plan, Network Principles, Preparing the Network Diagram, Critical path Analysis, PERT **Project Scheduling**- Activity Duration Estimates, Project Schedule Calculations.

[10 Hrs]

**UNIT- III**

**Schedule Control-** Project Control Process, Effects of Actual Schedule Performance, Incorporating Project changes into the schedule, Updating the Project Schedule, Approaches to schedule control

**Resource Considerations-** Resource constrained Planning, Planned Resource Utilization, Resource Leveling, Resource Limited Scheduling

[10 Hrs]

**UNIT - IV**

**Risk Management** – Risk, Categories of Risk, A framework for dealing with Risk, Evaluating Risks to the Schedule, Monte Carlo Simulation and Critical Chain concepts

**Project Cost Planning and Performance** – Project Cost Estimates, Project Budgeting, Determining the actual cost, determining the value of work performed, Cost Performance Analysis, Cost Forecasting, Cost Control, Project Control and Closure, Project Management Issues with regard to New Technologies

[10 Hrs]

### **TEXT BOOKS:**

1. Clements and Gido, "Effective Project Management", Cengage Learning, 2012
2. Bob Hughes, Mike Cotterell, RajibMall, "Software Project Management", Fifth Edition, Tata McGraw Hill, 2013

### **REFERENCE BOOKS:**

1. Samuel J. Mantel, "Project Management", Wiley India Edition, 2006
2. Jeffrey K. Pinto, "Project Management – Achieving Competitive Advantage", 3<sup>rd</sup> Edition Pearson Education, 2013.

**INSTRUCTIONS TO PAPER SETTERS:** **Max. Marks: 60**

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**UNIT - I**

**E-Commerce:** Introduction , The e- commerce environment , The e-commerce marketplace, Focus on portals, Location of trading in the marketplace , Commercial arrangement for transactions , Focus on auctions , Business models for e-commerce , Revenue models , Focus on internet start , up companies , the dot com , E-commerce versus E-business.

**E-commerce Types:** Inter-organizational transaction, Purchasing online, After sales online-internet trading relationship, B2B, EDI & its impact on Business, B2C, Intra-organizational E-commerce, Supply chain management.

[10 Hrs]

**UNIT - II**

**M-Commerce:** Introduction , Infrastructure Of M-Commerce , Types Of Mobile Commerce Services , Technologies Of Wireless Business , Benefits And Limitations, Support, Mobile Marketing & Advertisement, Non Internet Applications In M-Commerce, Wireless/Wired Commerce Comparisons, Framework For The Study Of Mobile Wireless Devices For Mobile Commerce , Towards A Classification Framework For Mobile Location Based Services , Wireless Personal And Local Area Networks

[10 Hrs]

**UNIT - III**

The Impact Of Technology Advances On Strategy Formulation In Mobile Communications Networks, The Ecology Of Mobile Commerce , The Wireless Application Protocol, Mobile Business Services , Mobile Portal , Factors Influencing The Adoption Of Mobile Gaming Services , Mobile Data Technologies And Small Business Adoption And Diffusion , M-Commerce In The Automotive Industry , Location , Based Services: Criteria For Adoption And Solution Deployment , The Role Of Mobile Advertising In Building A Brand , M-Commerce Business Models.

[10 Hrs]

**UNIT - IV**

Electronic-business E-business solution matrix- electronic Customer Relationship Management & it's strategies, Strategies for web auctions- virtual communications & web portals, E-shopping. Electronic payment Systems Digital Payment Requirements- Digital Token-based

Electronic Payment Systems Classification of New Payment Systems- Properties of E-cash-  
Cheque Payment Systems on internet- Risk and Electronic Payment Systems- Designing  
Electronic Payment System- Digital Signature. E-commerce Security Issues & Solutions:  
Security and Threats- Encryption- Cryptography and Authentication.

[10 Hrs]

**TEXT BOOKS:**

1. Dave Chaffey, "E-Business and E-Commerce Management", Pearson Education, 3<sup>rd</sup> Edition, 2009.
2. Brian E. Mennecke, Troy J. Strader, "Mobile Commerce: Technology, Theory and Applications", Idea Group Inc., I RM press, 2003.

**REFERENCE BOOKS:**

1. P. J. Louis, "M-Commerce Crash Course", McGraw Hill, 2001.
2. Paul May, "Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business", Cambridge University Press, 2001.
3. Michael P. Papazoglou, Peter M.A. Ribbers, "e-business organizational and Technical foundation", Wiley India 2009.

aper Code: MCA-319	L	P	C
aper: Distributed Systems and Parallel Processing	4	0	4

STRUCTIONS TO PAPER SETTERS:	Max. Marks: 60
Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.	
Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks.	

UNIT-I	
<b>Fundamentals of Distributed Computing:</b> Architectural models for distributed and mobile computing systems, Basic concepts in distributed computing, Middleware: distributed objects, web services.	
<b>Distributed Operating Systems:</b> Overview, Network Operating Systems, Distributed file systems, Middleware, Client/Server Model for computing.	[10 Hrs]

UNIT-II	
<b>Communication: Message Passing</b> - Introduction, Desirable features of good message passing system, Issues in IPC by Message passing, RPC, RMI Synchronization, Buffering, Multidatagram messages, Encoding and decoding of message data, Process addressing, Failure handling, Group communication.	

UNIT-II	
<b>Synchronization:</b> Introduction, Inherent Limitations of a Distributed System, Lamport's logical clock, Vector clock, Global states, Concept of Process, Process Migration, Threads Clock synchronization, Event ordering, Mutual Exclusion, Deadlock, Election Algorithms in distributed systems.	[10 Hrs]

UNIT-III	
<b>Distributed Databases:</b> Distributed Data Storage, Fragmentation & Replication, Transparency, Distributed Query Processing and Optimization, Distributed Transactions, Nested transactions, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control, Distributed Deadlock: Deadlock Prevention, Avoidance, Detection and Resolution, Commit Protocol.	[10 Hrs]

UNIT-IV	
<b>Parallel Processing:</b> Basic Concepts: Criteria for judging the architecture, Architectural classification schemes, Trends towards parallel processing, Parallelism in uniprocessor systems, Parallel Computer Structure, Applications of parallel processing. Principles of Pipelining, Parallel processing terminology, Design of parallel algorithms, Design of Parallel Databases, Parallel Query Evaluation.	[10 Hrs]

### **TEXT BOOKS:**

1. Tannenbaum, A, Maarten Van Steen, "Distributed Systems, Principles and Paradigm", Prentice Hall India, 2<sup>nd</sup> Edition, 2013.
2. Elmarsi, Navathe, Somayajulu, Gupta, "Fundamentals of Database Systems", 5<sup>th</sup> Edition, Pearson Education, 2009

### **REFERENCE BOOKS:**

1. Tanenbaum, A, HerbertBos, "Modern Operating Systems", Pearson Education, 4<sup>th</sup> Edition, 2014.
2. Singhal and Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill Education, 1994.
3. Gerald Tel, "Distributed Algorithms", Cambridge University Press, 2nd Edition, 2000
4. Attiya, Welch, "Distributed Computing", Wiley India, 2006
5. Coulouris, Dollimore and Kindberg, "Distributed Systems", Pearson, 2009.

**INSTRUCTIONS TO PAPER SETTERS: Max. Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks.

**UNIT - I****Introduction to Management and Organizational Behavior:**

Introduction- Meaning and Nature of Management, Management Functions and Processes. Evolution of Management Principles ; Scientific Management Theories ; Taylor and Scientific Management, Fayol's Administrative Management, Bureaucracy, Hawthorne Experiments and Human Relations, Social System Approach Conceptual Framework; Evolution of Organizational Behavior- Classical, Neo Classical and Modern Approaches, Contemporary School of Management Thoughts, Strategy and Organizational Behavior.

**[10Hrs]****UNIT - II**

**The Individual Behavior-** Factors affecting Individual Behavior, Personality – Definition, Determinants, Types, Relating Personality to Behavior, Learning Process, Motivational Process- Need Theories, Managing Motivation-The Organization, The Individual, Perceptual Process, Attitudes and Values. **Group Behavior:** Groups- Definition, Types, Theories of Group formation, Group Roles and Norms, Interpersonal relations, Group Dynamics, Management of Organizational Conflicts, Management of Change, Leadership Styles & Leadership Development.

**[10Hrs]****UNIT - III**

**Organizational structure & Design,** Organizational Designs; Emerging Design Options Different Organizational Structures; Communication Process, Effectiveness, Networks and Dynamics. Organizational Culture (creation and sustenance of cultures), Organizational Ethos, Dimensions of Culture, Importance of Culture; Managing Culture; High performance culture, Learning organizations, Organizational climate, Model for Managing Change, Forces for Change, resistance to change, Management of resistance.

**[10Hrs]****UNIT - IV**

Total Quality Management(TQM) and Organizational Behavior, Techniques of TQM, Re-engineering, Empowerment, Benchmarking, Downsizing, OB and Six Sigma Practices. Controlling: Concept, Types of Control, Methods: Pre-control: Concurrent Control: Post-control, An Integrated Control System.

**[10Hrs]**

### **TEXT BOOKS:**

1. Stephen P. Robbins, David & Decenzo, "Fundamentals of Management", Pearson Education, 9<sup>th</sup> Ed., 2008.
2. Singh & Chabra, "Organization Theory & Behavior", Educational & Technical Publisher, 2005.
3. T.N. Chhabra, R. K. Chopra and Archana Despande, "Leading Issues in Management & Organizational Behavior (Text & Cases)", Sun India Publications, 2009.
4. Prasad L. M, "Principles of Organizational Behavior and Management", 2001.
5. Udai Pareek, "Understanding Organizational Behavior", Oxford University Press 1<sup>st</sup> Ed., 2004.
6. Robbins, S. P., Judge, T. A. and Sanghi, S, "Organizational Behavior", Pearson, 2009.

### **REFERENCE BOOKS:**

1. Stoner, "Management", PHI, 6<sup>th</sup> Ed., 2002.
2. J. S. Chandan, "Organizational Behavior", Vikas Publishing House, 2004.
3. Joseph W. Weiss, "Organizational Behavior & Change, Managing Diversity, Cross-Cultural Dynamics& Ethics", Vikas Publishing House, 2<sup>nd</sup> Ed., 2001.
4. Richard Pettinger, "Introduction to Management", Palgrave McMillan , 3<sup>rd</sup> Ed., 2002.
5. Fred Luthans, "Organizational Behavior," McGraw Hill International Edition, 9<sup>th</sup> Ed., 2002.
6. Kavita Singh, "Organization Behavior Text and Cases", Pearson, 2010.

**INSTRUCTIONS TO PAPER SETTERS:** **Max. Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks.

**UNIT - I**

Parallel computer models: The state of computing, Multiprocessors and multicomputer, Multi-vector and SIMD computers, Architectural development tracks. Program and network properties : Conditions of parallelism, Data and resource dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Program flow mechanisms, Control flow versus data flow, Data flow architecture, Demand driven mechanisms, Comparisons of flow mechanisms

[10 Hrs]

**UNIT - II**

System Interconnect Architectures: Network properties and routing, Static interconnection networks, Dynamic interconnection Networks, Multiprocessor system interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network. Processors and Memory Hierarchy: Advanced processor technology; Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors. Memory Technology: Hierarchical memory technology, Inclusion, Coherence and Locality, Memory capacity planning, Virtual Memory Technology

[10 Hrs]

**UNIT - III**

Backplane Bus System: Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt, Cache addressing models, Direct mapping and associative caches. Pipelining :Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch handling techniques, Arithmetic Pipeline Design, Computer arithmetic principles, Static arithmetic pipeline, Multifunctional arithmetic pipelines

[10 Hrs]

**UNIT - IV**

Vector Processing Principle: Vector instruction types, Vector-access memory schemes. Synchronous Parallel Processing: SIMD Architecture and Programming Principles, SIMD Parallel Algorithms, SIMD Computers and Performance Enhancement

[10 Hrs]

### **TEXT BOOKS:**

1. Kai Hwang, "Advanced computer architecture", TMH, 2<sup>nd</sup> Edition, 2010.

### **REFERENCES BOOKS:**

1. M.J Flynn, "Computer Architecture, Pipelined and Parallel Processor Design", Narosa Publishing, 1995.
2. D.A.Patterson, J.L.Hennessy, "Computer Architecture: A quantitative approach", Morgan Kauffman Series, 2002.

Paper Code: MCA-325

Paper: Digital Signal Processing

L	P	C
4	0	4

**INSTRUCTIONS TO PAPER SETTERS:** **Max. Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks.

**UNIT - I**

**Discrete Fourier Transform:** Overview of Signals and Systems, Introduction to Z transform and DTFT , DFT and its properties, FFT computations using Decimation in time (DIT) and Decimation in frequency (DIF) algorithms for radix 2 and composite number

[10Hrs]

**UNIT - II**

**Infinite Impulse Response Digital Filters (IIR):** Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain - Design of IIR digital filters using impulse invariance technique - Design of digital filters using bilinear transform - pre warping - Realization using direct, cascade, parallel

[10Hrs]

**UNIT- III**

**Finite Impulse Response Digital Filters (FIR):**Symmetric and Antisymmetric FIR filters - Linear phase FIR filters - Design using Hamming, Hanning Rectangular, Blackmann and Bartlett Windows - Frequency sampling method - Realization using direct, cascade.

[10Hrs]

**UNIT - IV**

**Finite Word Length Effects:**Fixed point and floating point number representations - Comparison - Truncation and Rounding errors - Quantization noise - derivation for quantization noise power - coefficient quantization error - Product quantization error - Overflow error - limit cycle oscillations due to product roundoff and overflow errors . Introduction to Multirate signal processing-Decimation-Interpolation, rational sampling rate conversion Applications of Multirate signal processing

[10Hrs]

### **TEXT BOOKS:**

1. John G Proakis, Dimtris G Manolakis, "Digital Signal Processing Principles, Algorithms and Application", PHI, 3rd Edition, 2000.
2. Alan V Oppenheim, Ronald W Schafer, John R Back, "Discrete Time Signal Processing", PHI, 2nd Edition 2000.

### **REFERENCE BOOKS:**

1. Johny R. Johnson, "Introduction to Digital Signal Processing", Prentice Hall, 1984.
2. S.K.Mitra, "Digital Signal Processing - A Computer based approach", Tata McGraw-Hill, 1998, New Delhi.

**Paper Code: MCA-327**

**Paper: Soft Computing**

<b>L</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>4</b>

**INSTRUCTIONS TO PAPER SETTERS:** **Max. Marks: 60**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
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**UNIT-I**

AI Problems and Search: AI problems, Techniques, Problem Spaces and Search, Heuristic · Search Techniques- Generate and Test, Hill Climbing, Best First Search Problem reduction, Constraint Satisfaction and Means End Analysis. Approaches to Knowledge Representation- Using Predicate Logic and Rules.

[10 Hrs]

**UNIT-II**

Artificial Neural Networks: Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Backpropogation Network. Asssociative Memory Networks. Traing Algorithms for pattern association, BAM and Hopfield Networks.

[10 Hrs]

**UNIT-III**

Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propogation Networks, Adaptive Resonance Theory Networks. Special Networks- Introduction to various networks.

[10 Hrs]

**UNIT-IV**

Introduction to Classical Sets ( crisp Sets)and Fuzzy Sets- operations and Fuzzy sets. Classical Relations and Fuzzy Relations- Cardinality, Operations, Properties and composition. Tolerance and equivalence relations. Membership functions- Features, Fuzzification, membership value assignments, Defuzzification. Fuzzy Arithmetic and Fuzzy Measures, Fuzzy Rule Base and Approximate Reasoning Fuzzy Decision making Fuzzy Logic Control Systems. Genetic Algorithms.

[10 Hrs]

### **TEXT BOOKS:**

1. S N Sivanandam, S N Deepa, "Principles of Soft Computing", Wiley India, 2007.
2. Fakhreddine O Karray, Clarence D Silva, "Soft Computing and Intelligent System Design", Pearson Edition, 2004.

### **REFERENCE BOOKS :**

1. Amit Konar, "Artificial Intelligence and SoftComputing- Behavioural and Cognitive Modelling of the Human Brain", CRC press, Taylor and Francis Group.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", TMH, 2008.
3. Patric Henry Winston, "Artificial Intelligence", 3<sup>rd</sup> Edition, Pearson Education.

EMERGING TRENDS	
Course Code: MCA - 329 Contact Hours: L-4 P-0 C-4 Course Category: Departmental Elective	Credits: 4 Semester: 5

## Introduction

The field of computer science is continuously evolving over time. Every few years, new trends emerge. With the penetration of mobile and improvement in Internet connectivity, the use of multimodal data (text, images, video, audio) have become prevalent. Therefore, keeping in view of this emerging trend, the purpose of this course is to introduce the computational methods in the area of deep learning and apply them to process multimodal data.

## Course Objectives

- Introduction to computational methods in deep learning.
- Application of deep learning to problems in vision, text, and speech.

## Pre-requisites

- Data science and machine learning.
- Good knowledge of any one (preferably Python) programming language.

**Course Outcome** Upon successful completion of this course, students will be able to:

- Understand the intuitions behind the computational methods in deep learning domain.
- Would be able to apply deep learning algorithms on text, image and speech.

## Pedagogy

- Acquaintance to contemporary and futuristic trends by motivating examples / use cases.
- Explanation of complex ideas through lucid / abstract introductions.
- Experimentation of ideas through course projects.

## Evaluation Scheme

Component	Minors (I & II)	Major	Assignments	Total
Theory	30%	60%	10%	100%
Practical	30%	60%	10%	100%

## Contents

UNIT-I	12 Hours
Deep Learning: Recap of Logistic Regression, Neural Networks, Gradient Descent, Backpropagation, Hyperparameter Tuning, Training Measurement, Bias vs Variance,	

Regularization, Dropouts, Initialization, Convergence, Optimizing Training, Evaluation Metrics, Visualizations, Applications.

UNIT-II	10 Hours
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Applications in Vision: Image Representation, Convolution, Filter Size, Padding, Pooling, Case Studies: ResNet, Inception. Transfer Learning, Object Detection – Landmark Prediction, Bounding Box Prediction, One Shot Learning, Siamese Network.

UNIT-III	10 Hours
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Applications in Text: Sequence Models, Recurrent Neural Network, Time Varying Backpropagation, RNN types, Gated Recurrent Unit, Long Short Term Memory, Deep and Bidirectional RNN, Word Embeddings – Count Vectorizer, TF-IDF, Word2Vec, GloVe vectors, Text Classification.

UNIT-IV	10 Hours
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Applications in Speech: Audio Representations, Feature Extraction from Audio, CNN & RNN on audio data.

Advanced Topics: Autoencoders, Deep Generative Models, Image and Text Augmentation Methods, Network Representation Learning – Node Embeddings, Graph Neural Networks.

Text Books	
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1	Ian Goodfellow and Yoshua Bengio and Aaron Courville. Deep Learning. MIT Press, 2016.
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2	Francois Chollet. Deep Learning with Python, Manning Publications, 2017.
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Reference Books	
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1	Josh Patterson, Adam Gibson. Deep Learning: A Practitioner's Approach. O'Reilly Media, 2017.
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