

RANI DURGA VATI UNIVERSITY, JABALPUR
Syllabus of M.Sc. Computer Science Semester III & IV
(Session 2017 – 2018 and Onwards)

Sr.No.	Title of the paper	Remark	Th/Pr/Sessional
M.Sc. (Computer Science) Semester-III			
301	Software Engineering	Theory	40+10
302	RDBMS(SQL programming with Oracle)	Theory & /practical	40+25+10
303	Advance Java Programming	Theory & practical	40+25+10
304	Principles of Compiler Design	Theory	40+10
305	Computer Graphics (with Multimedia)	Theory & /practical	40+25+10
		Total	325
M.Sc. (Computer Science) Semester –IV			
401	Optimization Techniques	Theory	40+10
402	Artificial Intelligence	Theory & /practical	40+25+10
403	Data Warehousing and Data Mining	Theory	40+10
404	Computer Network	Theory	40+10
405	Object Oriented Modelling & Design using UML	Theory	40+10
	Minor Project on Java/ .Net technology		50
		Total	325

UNIT-I:- Software Processes: Processes projects and products, Component software processes, characteristics of a software process, software Development Process, project management process, software configuration management process, software configuration management process, process management process.

Software requirement Analysis and Specification: Software requirement, need for SRS, requirement process, problem analysis, analysis issues. Informal approach, structured analysis, object oriented modeling, other modeling approaches, prototyping, requirement specification, characteristics of an SRS, component of an SRS, specification languages, structure of requirement document validation requirement reviews, other method metrics, size measures, quality metrics.

UNIT-II- Planning Software Project:- Cost estimation, uncertainties in cost estimation, building cost estimation models, on size estimation, COCOMO model, project scheduling, average duration estimation, project scheduling and milestones, staffing and personnel planning, rayleigh curve, personnel plan, team structure, software configuration management plans, quality assurance plans, verification and validation, project monitoring plans, risk management.

UNIT-III- Function Oriented Design:- Design principles, coupling, cohesion, design notation and specification, structured design methodology, verification, network metrics, stability metrics, information flow metrics Software Testing.

UNIT-IV- Testing Methods : Software testing fundamentals, test case design, white box testing, control structure testing, black-box testing, testing for specialized environments. Software Testing Strategies: A Strategic Approach to software testing, strategic issues, unit testing, validation testing, system testing, the art of debugging.

UNIT-V - Re-Engineering : Software re-engineering, software maintenance, a software reengineering process model, reverse engineering, reverse engineering user interfaces, restructuring, code restructuring, data restructuring, forward engineering the economics of reengineering.

Client/Server software Engineering: The structure of client/server systems, software engineering for c/s systems, analysis modeling issues, design for C/S systems, testing issues. Computer-Aided software Engineering: What is case, building blocks for case, a taxonomy of case tools, integrated case environments, the integration architecture, the case repository.

Text Books:

1. Presman Roger, Software, Engineering: A Practitioner's Approach Tata McGraw Hill, New Delhi.
2. Jalote Pankaj, An Integrated Approach to Software Engineering Narosa, New Delhi.

Reference Books:

1. R.E. Fairly. Software Engineering Concepts. McGraw Hill, Inc 1985.
2. Poyce, Software Project Management, Addison-Wesly.
3. Sommerville , Software Engineering, Addison-Wesly.

M.Sc.-302 : RELATIONAL DATA BASE MANAGEMENT SYSTEM
(SQL PROGRAMMING USING ORACLE)

MAX.MARKS: 40

PASS MARKS: 16

UNIT-I:- INTRODUCTION: -Advantages of DBMS approach, various views of data, data independence, Schema & sub-schema, Primary concepts of data models, Database languages, Transaction management, Database administrator & uses, data dictionary, Overall system architecture.

ER MODEL: - Basic concept, Design issues, Mapping constraints, Keys, ER diagram, weak & strong entity sets, specialization & generalization, aggregation, inheritance, design of ER schema, Reduction of ER schema to tables.

UNIT –II:- DOMAIN RELATIONS & KEYS :- Domains, Relations, Kinds of relation, relational databases, various types of keys, candidate, primary, alternate & foreign Keys. RELATION ALGEBRA & SQL :- The structure, relation algebra with extended operations, Modification of database, idea of relational calculus, Basic structure of SQL, set operation, Aggregate function, Null values, Nested subqueries, Derived relations, views modification of database, Join relations, DDL & SQL .

UNIT– III:- FUNCTIONAL DEPENDENCIES & NORMALIZATION: Base definitions, Trivial & non-Trivial dependencies, Closure set of dependencies & of attributes, Irreducible set of dependencies, introduction to normalization, Non- loss decomposition, FD diagram of I, II & III NF, Dependencies prevention, BCNF, Multi-valued dependencies prevention's, BCNF, Multi-valued dependencies & ANF, Join dependencies & 4 NF.

DATABASE INTEGRITY :-General idea, Integrity rules, Domain rules, Attribute rules, Relation rules, Database rule, assertions, triggers, Integrity & SQL.

UNIT -IV:- DISTRIBUTED DATABASES :- Basic idea, distributed data storage, Data replication, Data Fragmentation, horizontal, vertical & mixed fragmentation.

EMERGING TRENDS IN DBMS :- Object – Oriented database- Basic idea & the model Object structures Object, Class, inheritance, multiple object identity, Data warehousing terminology, definitions, characteristics, Data mining & its overview, Database on www, multimedia database difference with conventional DBMS, issues, similarity based retrieval continuous media data, multimedia data formats, video servers.

UNIT- V:- NETWORK & HIERARCHICAL MODEL: Basic idea , Data structure diagram, DBTG model, implementation, Tree structure diagram, Implementation techniques, comparison of three models.

TRANSACTION CONCURRENCY & RECOVERY:- Basic concept, ACID properties, Transaction state, Implementation of atomicity & durability concurrent executions, Basic idea of serializability, Basic idea of concurrency control, Basic idea of deadlock, Failure classification, storage structure - types, stable storage implementation, data access, Recovery & Atomicity – Log based recovery, deferred database modifications, immediate database modifications, checkpoints.

Text Books:-

1. Henry F. Korth & A. Silbershatz: Data System Concepts. Mc-GrawHill.
2. Arun K. Majumdar & P.Bhattacharya: Data Base Management System. TMH

Reference Books:-

1. Bipin C. Desai: An Introduction to Database System, Galgotia Pub. Co.Ltd.
2. Jeffrey O. Ullman: Principles of Database Systems, Galgotia Pub. Co.Ltd.
3. James Martin: Principles of Database Management . PHI
4. James Martin, Computer Database organization. PHI

Unit-I

Introduction to Applet and Swing – Creating Applet in Java, Identifying various stages of an Applet life Cycle, various Graphic method in java, the AWT control components, the Swing component class Hierarchy, using top level swing containers , using intermediate level swing containers, using the atomic component, using the Layout Manager, Flow Layout Manager, Border Layout Manager and Grid Layout Manager.

Unit-II

Introduction to Event Handling – Identifying the source of Event, Event Listeners and Event Handlers, the Delegation Event Model, Event classes, Event Listener Interface, ActionListener interface, MouseListener Interface Adapter classes- the Mouse Adapter class, the MouseMotion Listener Interface.

Unit-III

Introduction to JDBC – What is JDBC. Database connectivity , JDBC Architecture, JDBC drivers, Using JDBC API – Loading a Driver, connecting and executing JDBC statement, Handling SQL Exceptions. Accessing Result Sets, method of Result Set interface, Methods of PreparedStatement interface , retrieving row, inserting row, Managing Database Transactions, creating and calling stored procedures in JDBC, using Metadata in JDBC.

Unit-IV

Introduction to JavaBean – javabeen concept, software components and javabeans , elements of javabeans, javabeen component specification, services of javabeen components, types of javabeen. Beans development kit, user defined javabeans, creating javabeen Applet using BDK, types of javabeen properties creating custom Events, Event class, EventListener, Event Handler.

Unit-V

RMI – Overview of distributed Application , Remote Method Invocation, components of RMI application , RMI architecture, RMI Packages, Distributed Garbage collection, creating Distributed application using RMI, creating remote interface, implementing remote interface, creating RMI server, creating RMI client, Running the RMI application, Transmitting files using RMI , client side cabscks.

Text Books :

1. Mastering Java2 – John Zukowski, BPB Publication
2. Java Programming – Khalid Mughal, Pearson Education.

Reference Books :

1. Advance Java Programming – Amit K. Mishra
2. Black Book – Java Programming – Dreamtech.

Unit-I-

Introduction to Automata Theory : Mathematical Preliminaries: sets and relations ,Graphs language, alphabets, strings, recursive definitions, regular expressions, Finite automaton (FA), Deterministic FA(DFA), Non Deterministic FA (NFA), Turing machine, FA with null strings, Transition graphs, FA with outputs Conversations of FA and regular expressions, Regular languages and their closure properties pumping lemma for regular languages, Non regular languages.

Unit-II :

Push down Automata Theory : Context free grammars, context free languages ICFL) , Deviation trees, Chomsky normal form ambiguity in CFG, Pushdown Automata (PDA), PDA and CFL equivalence, pumping lemma for CFL, non CFL, closure properties of CFL.

Unit-III :

Compiler and Translators, why do we need translators, the structure of Compiler, Lexical Analysis, Syntax analysis, Intermediate code generation, Book keeping, error handling.Finite Automata and Lexical analysis, The role of the lexical analyzer, regular expressions, finite automata, from regular expression to finite automata, minimizing the number of states of a DFA, A Language for specifying lexical analyzer, implementation of lexical analyzer using lex.

Unit-IV

Context - free grammars, derivation of parse trees, capabilities of CFGs, Parsers, shift-reduce parsing, operators precedence parsing, top -down parsing, Predictive parsing, LR parsers, The canonical collection of LR (0) items, constructing SLR parsing tables, constructing canonical LR parsing tables, constructing LALR parsing tables, Simple parsing exercises using yacc.

Unit-V

Syntax-directed translations schemes, implementation of syntax-directed translators, intermediate code, postfix notation, parse trees and syntax trees, three-address code, quadruples, and triples, translations of assignment statements, Boolean expressions, statements that alter the flow of control, cost fix translations, translation with the top-down parser. Symbol tables, the contents of symbol tables, data structures for symbol tables, representing scope information, run time storage administration, implementation of a simple stack allocation schemes, implementation of block- structured languages, storage for block - structured languages.

Text Books:

1. Principles of Compiler Design by Alfred V. Aho., Jeffrey D. Ullman.
2. "Compilers: Principles, Techniques and Tools" Aho, Ravi Sethi, Ullman, Pearson Education, VIII Ed. 2002.
3. Introduction Computer Theory by Daniel A Cohen.

Reference Books:-

1. Lex and Yacc by Johan R. levine, Tonny Mason, et. al. O’ Reilly and Associates.
2. “Compilers Design in C” Allen I. Holub, PHI eastern economy edition 2003.

M.Sc.-305 : COMPUTER GRAPHICS (WITH MULTIMEDIA)

Max. Marks: 40

Pass. Marks: 16

Unit-I- A Brief background about applications of Computer Graphics, Overview of Graphics Systems, Video display devices, Refresh cathode ray tubes, Raster and random scan displays, colour CRT monitors, Flat panel displays, LCDs. Design and architecture of raster scan and random scan display systems. A brief introduction to input devices and hardcopy devices.

Output primitives, DDA and Bresenham's 2D line drawing algorithms, Parallel line algorithms.

Unit-II- Midpoint circle generating algorithm, Ellipse generating algorithm, Other curves, Filled area primitives, Scan line polygon fill algorithm, Inside outside test, Boundary fill algorithm, Flood fill algorithm, Character generation, Attributes of output primitive, line and curve attributes, Character attributes.

Unit-III- Anti-aliasing, Two dimensional geometric transformations, Composite transformations, General Composite Transformations and Computational Efficiency, Other transformations, Affine transformation, Two dimensional viewing, Window to viewport coordinate transformation.

Unit-IV- Clipping operations, Cohen Sutherland line clipping, Liang Barsky line clipping, Nicholl-Lee-Nicholl line clipping, polygon clipping, Sutherland Hodgeman and Weiler Atherton Polygon clipping, Text and curve clipping.

Three dimensional concepts, Display methods, polygon surfaces, quadric surfaces and superquadrics.

Unit-V- Three dimensional Geometric and Modelling Transformations, General three dimensional rotation, Three dimensional viewing pipeline, Projections, Parallel and perspective projection, View volume and general Projective transformation.

Visible Surface Detection Methods, Back Face detection, Depth Buffer Method, A buffer method, Depth sorting method.

Text Book:-

1. Donald Hearn and M. Pauline Baker, Second Edition, Prentice Hall of India, 1997. Unit I (pp 35-45, 53-72, 84-92), Unit II (pp 97-112, 117-130, 131-133, 143-152, 163), Unit III (pp 171-174, 183-203, 208, 217-220), Unit IV (pp 224-242, 244, 296-301, 305-313) Unit V (pp 407-423, 432-456, 469-480).

Reference Book:-

1. J.D. Foley, A van Dam, S.K. Feiner, J.F. Hughes, Addison Wesley Publ. Company, 1997.
2. Jim Blinn, Jim Blinn's Corner: A trip Down the Graphics Pipeline, Morgan Kaufman, 2000.

UNIT-I- Linear Programming-Mathematical formulation of Problems, graphical solution, simplex method, two phase method, Big M Method, concept of duality, dual simplex method, Degeneracy and its resolution, sensitivity analysis.

UNIT-II- Assignment problems- Mathematical formulation, Hungarian method for solution, unbalanced assignment problems, infeasible assignment, Crew based problems, Transportation problems-Vogel's approximation method, optimal solution by stepping stone method and modified distribution method, degeneracy in transportation problems, transshipment problems.

UNIT-III- Game theory, two person zero sum game, minimax (maximin) criterion, solution of games with saddle point and without saddle point, equivalence of the rectangular game and linear programming and solution by simplex method, concept of dominance, graphical method for $2 \times n$ and $m \times 2$ games, algebraic method for a general game, iterative method, Sequencing problems of n jobs through 2 machines, 3 machines, and n jobs through m machines.

UNIT-IV- Replacement problems- replacement of items that deteriorate, with time, money value and present worth factor, Replacement policy when money value changes, replacement of items that are failed completely, group replacement of items, integer programming, Nonlinear programming problem, Kuhn Tucker conditions, graphical solution, quadratic programming, solution by Wolfe's method.

UNIT-V- Dynamic Programming minimum path problems, problems on single additive constraint additive separable return, single multiplicative constraint additive separable return, single additive constraint multiplicative separable return, serial multistage model, Development of CPM/PERT techniques, construction of network diagram, determination of critical path, probability of completing the project by scheduled date.

Text Books:

1. Gillett Billy E. Introduction to Operations Research : A Computer oriented algorithmic approach, Tata Mc-Graw Hill Publishing Company Ltd., New Delhi.
2. A Ckoff, R.L. and Sasieni, M.W. Fundamentals of Operations Research, Wiley, 1968.
3. Hadley G. Linear Programming, Oxford and IBH Publishing Co. Ltd. Ltd., New-Delhi.
4. Operations Research : S.D. Sharma,

UNIT-I:

What is Artificial Intelligence, what is an AI technique, criteria for success, Problems, problem spaces and search, Production system, Problem characteristics, Hill-climbing, Best-First search, AO algorithm, constraint satisfaction.

UNIT-II:

Natural language Processing, Introduction, overview of linguistics, Grammars and language, Basic Parsing techniques, Semantic analysis and representation, structure, Natural Language generation, Natural Language systems (Chapter 12, Dan w Paterson).

UNIT-III:

Knowledge Representation Issues, Approaches to knowledge Representation, Representing simple facts in logic, computable functions and predicates, Procedural vs declarative knowledge, forward vs Backward Reasoning matching, control knowledge.

UNIT-IV:

Expert systems, Rule-Based system architecture Non-production system Architecture, dealing with uncertainty, knowledge acquisition and validation, knowledge system Building tools. (Chapter 15, Dan W Patterson).

UNIT-V:

Pattern Recognition, Recognition and classification process, learning classification Patterns, Recognizing and understanding speech.

Text Books :

1. Artificial Intelligence Elaine Rich and Kevin Knight Tata Mc-Graw Hill Edition.
2. Introduction to Artificial Intelligence and expert system. Dan. W. Patterson Prentice–Hall of India.

Reference Books:

1. Principles of Artificial Intelligence by Nils J. Nilson (Narosa Publication).

M.Sc. –403 COMPUTER NETWORKS

MAX.MARKS: 40

PASS MARKS: 16

UNIT-I:-

Users of Computer Network, Network Hardware, Network software, Protocol Hierarchies, Design issue for the layers, Interfaces and services, connection oriented and connection-less services, service primitives, the relationship of services, to protocols, Reference Models, comparison of OSI and TCP/IP Reference models, Data communication services, SMDS, X.25, Frame Relay, Broadband ISDN, ATM and comparison of services.

UNIT-II:-

Physical layer, Theoretical Basis for data communication, Bandwidth-limited signals. Maximum Data Rate of a Channel, Transmission media, Magnetic media, Wireless, Transmission, The telephone systems, Narrowband and Broadband ISDN and ATM, communication satellites.

UNIT-III-

Data Link layer, Design issues, Services provided to the Network layer, error detection and correction, elementary data link protocols, sliding window protocols, Protocol specification and verification, Case studies, HDLC and the Data link layer in the Internet.

UNIT-IV-

Network layer design issues, routing algorithms, the optimality principle, shortest path routing, Flooding, Flow-based Routing, Distance-vector and link-state routing broadcast and Multicast Routing, Congestion control algorithms, general principles of congestion control, Traffic shaping, choke packets, load shedding, jitter control.

UNIT-V-

The transport layer, The transport service, Quality at service, Transport service Primitives, Addressing establishing a connection, Releasing a connection, Flow-Control and Buffering, Multiplexing, crash Recovery, The Internet Transport protocols, TCP service model, TCP protocol, TCP segment header, TCP connection management, TCP transmission policy, TCP congestion control, TCP timer management UDP.

Text Books:

1. Computer Networks, third edition, 1997 A.S. Tanenbanm, P.H.I.

Reference Books:

1. Data and Computer Communication 1996 William Stallings, P.H.I.

UNIT-I:

The object Model, the evolution of object model, elements of object model, applying the object model, Classes and Objects, Relationships among objects, the nature of a class, relationship among classes, the interplay of classes and objects, on building quality classes and objects (Chapter 2,3 from Grady Booch)

UNIT-II:

Advanced object Modeling, Aggregation, Abstract Classes, Generalization as extension and Restriction, Multiple inheritance, Metadata, Candidate Keys, Constraints. Dynamic Modeling – events and states, operations nested state diagrams, Concurrency, Functional Modeling, Data Flow Diagrams, specifying operations, Constraints, Relation of Functional to object and Dynamic Models.

UNIT-III:

Design Methodology, OMT as a software engineering methodology, Analysis, overview of analysis, Problem statement, overview of system Design, Breaking a system into subsystems, identifying Concurrency, Allocating subsystems to processes and tasks, Management of data stores, Handling global resources, choosing software control implementation, Handling Boundary condition, setting trade off priorities, Common architectural frameworks.

UNIT-IV:

Object Design, overview of object Design, Combining the three models, Design algorithms, Design optimization, implementation of Control adjustment of inheritance, Design of Association, object representation, Physical packaging.

UNIT-V:

Implementation, from Design to implementation object-oriented style, Reusability, extensibility, Robustness, Object Oriented languages, Translating a Design into an implementation.

Text Books:

1. Object Oriented Modeling and Design by James Rumbaugh et. el. Edition P.H.I, 1991.
2. Object Oriented Analysis and Design with application. By Grady Booch (IInd ed.)'Addition Wesley (2000).

M.Sc.-405 : Data Warehousing and Data Mining

MAX.MARKS: 100

PASS MARKS: 40

UNIT-I:

Motivation, importance, Data type for Data Mining :relation Databases, Data Warehouses, Transactional databases, advanced database system and its applications, Data mining Functionalities: Concept/Class description, Association , Analysis classification & Prediction, Cluster Analysis, Outlier Analysis, Evolution Analysis, Classification of Data Mining Systems, Major Issues in Data Mining.

UNIT –II:

Data Warehouse and OLAP Technology for Data Mining: Differences between Operational Database Systems and Data Warehouses, a multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology.

UNIT-III:

Data Preprocessing: Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation. Data Mining Primitives. Languages, and System Architectures, Concept Description: Characterization and Comparison, Analytical Characterization

UNIT-IV:

Mining Association Rules in Large Databases: Association Rule Mining: Market Basket Analysis, Basic Concepts, Mining Single-Dimensional Boolean Association Rules from Transactional Databases: the Apriori algorithm, Generating Association rules from Frequent items, Improving the efficiency of Apriori, Mining Multilevel Association Rules, Multidimensional Association Rules, Constraint-Based Association Mining.

UNIT-V:

Classification & Prediction and Cluster Analysis: Issues regarding , classification & prediction, Different Classification Methods, Prediction, Cluster Analysis, Major Clustering Methods, Applications & Trends in Data Mining: Data Mining Applications, currently available tools.

BOOKS

1. J., Han and M. Kamber, -Data Mining: Concept and Techniques", Morgan Kaufmann Pub.
2. Berson -Dataware housing, Data Mining& DLAP, @004, TMH.
3. W.H. Inmon - Building the Datawarehouse, 3ed, Wiley India.
4. Anahory, "Data Warehousing in Real World", PearSon Education.
5. Adriaans, "Data Mining", Pearson Education.
6. S.K. Pujari, -Data Mining Techniques", University Press, Hyderabad.