

NIT SCHEME
COURSE OF STUDY AND SCHEME OF EXAMINATION OF B.TECH./B.ARCH./M.TECH/M.C.A.
NATIONAL INSTITUTE OF TECHNOLOGY OF RAIPUR

Branch:- **Master of Computer Applications (M.C.A.)**
Semester:- **IVth Sem.**

Course:- **P.G.**

S. No.	Board of Study	Subject Code	Subject Name	Period Per Week			Scheme of Examination			Total Marks	Credit [L+(T+P)/2]
				L	T	P	ESE	CT	TA		
1.	MASTER OF COMP. APP.	CA40411(CA)	Artificial Intelligence & Expert System	4	1	0	100	20	20	140	5
2.	MATHS	MA40412(CA)	Statistical Computing	4	1	0	100	20	20	140	5
3.	MASTER OF COMP. APP.	CA40413(CA)	Principles of Compiler Design	4	1	0	100	20	20	140	5
4.	MASTER OF COMP. APP.	CA40414(CA)	Software Engineering	4	1	0	100	20	20	140	5
5.	MASTER OF COMP. APP.	CA40415(CA)	Computer Graphics & Multimedia	4	1	0	100	20	20	140	5
6.	MASTER OF COMP. APP.	CA40421(CA)	Artificial Intelligence Lab	0	0	4	50	-	25	75	2
7.	MASTER OF COMP. APP.	CA40422(CA)	Computer Graphics Lab	0	0	4	50	-	25	75	2
8.	MASTER OF COMP. APP.	CA40423(CA)	Project Lab – I	0	0	4	50	-	50	100	2
9.	HUMANITIES & SOCIAL SCIENCES	HS40424(CA)	Report Writing & Seminar	0	0	2	-	-	50	50	1
Total				20	5	14	650	100	250	1000	32

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - IVth Semester MCA Code : CA40411(CA)

ARTIFICIAL INTELLIGENCE & EXPERT SYSTEM

UNIT – 1 : General Issues and overview of AI: The AI problems: what is an AI technique; Characteristics of AI applications Problem Solving, Search and Control Strategies General Problem solving; Production systems; Control strategies; forward and backward chaining Exhaustive searches: Depth first Breadth first search.

UNIT – 2 : Heuristic Search Techniques: Hill climbing; Branch and Bound technique; Best first search and A* algorithm; AND/OR Graphs; Problem reduction and AO* algorithm; Constraint Satisfaction problems Game Playing Min Max Search procedure; Alpha-Beta cutoff; Additional Refinements.

UNIT – 3 : Knowledge Representation : First Order Predicate Calculus; Skolemisation; Resolution Principle and Unification; Inference Mechanisms Horn's Clauses; Semantic Networks; Frame Systems and Value Inheritance; Scripts; Conceptual Dependency AI Programming Languages Introduction to LISP, Syntax and Numeric Function; List manipulation functions; Iteration and Recursion; Property list and Arrays, Introduction to PROLOG.

UNIT – 4 : Natural Language Processing and Parsing Techniques: Context – Free Grammar; Recursive Transition Nets (RTN); Augmented Transition Nets (ATN); Semantic Analysis, Case and Logic Grammars; Planning Overview – An Example Domain: The Blocks World; Component of Planning Systems; Goal Stack Planning (linear planning); Non-linear Planning using constraint posting; Probabilistic Reasoning and Uncertainty; Probability theory; Bayes Theorem and Bayesian networks; Certainty Factor.

UNIT – 5 : Expert Systems: Introduction to Expert Systems, Architecture of Expert Systems; Expert System Shells; Knowledge Acquisition; Case Studies; MYCIN, Learning, Rote Learning; Learning by Induction; explanation based learning.

Text Books :-

1. Elaine Rich and Kevin Knight: Artificial Intelligence – Tata McGraw Hill.
2. Dan W.Patterson, Introduction to Artificial Intelligence and Expert Systems – Prentice Hal of India.

References :

1. Nils J. Nilsson: Principles of Artificial Intelligence – Narosa Publication house.
2. Artificial Intelligence : A Modern Approach, Stuart Rusell, Peter Norving, Pearson Education 2nd Edition.
3. Artificial Intelligence, Winston, Patrick, Henry, Pearson Education.
4. Artificial Intelligence by Gopal Krishna, Janakiraman.

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - IVth Semester MCA Code : MA40412(CA)

STATISTICAL COMPUTING

Unit 1: BASIC STATISTICS:

Statistical Methods, Advantages and limitations of statistical methods, Frequency Distribution, Measures of central tendency, Measures of Dispersion, Skewness, moments and kurtosis, **Curve fitting** – Method of least square, Karl Pearson's coefficient of Correlation, Correlation of ranks, Tied Ranks, Curve of regression, line of regression coefficients, properties of regression coefficients and angle between two regression lines.

Unit 2: THEORY OF PROBABILITY:

Baye's theorem and its applications, Geometrical probability, Discrete random variable and its expected value, Probability function and Distribution of a discrete random variable, Mathematical expectation, Covariance, Variance of a linear combination of n random variables, Continuous random variable, Probability density and Distribution function, Joint probability density function of two variables, Moment generating function.

Unit 3: PROBABILITY DISTRIBUTION:

Binomial distribution, Poisson distribution, Normal distribution, Rectangular distribution, Exponential distribution; Moment generating function of Binomial distribution, Poisson distribution, Normal distribution, Rectangular distribution and Exponential distribution; Fitting of Binomial distribution, Poisson distribution, Normal distribution, Rectangular distribution and Exponential distribution.

Unit 4: SAMPLING:

Types and Techniques of sampling, Test of significance for large samples, Comparison of two large samples, Sampling of variables, Sampling distribution, Standard and Probable errors, Test of significance based on chi square test, t-test, F-test and Z-test.

Unit 5: STOCHASTIC PROCESSES:

Analysis of variance-Definition, Application and Assumptions, Limitation of Method of analysis of variance, Analysis of variance for one-way classification and two way classification ; **Design of experiments**- Definition and Planning of experiments, Basic principles of field experimentation, Completely Randomized Design, Randomized block design, Latin square design, Probability distribution and classification of stochastic process,, Markov process, Bernoulli process, Poisson process.

Text Books:

1. Mathematical Statistics- Ray, Sharma, Chaudhary, Ram Prasad and Sons.
2. Statistical Analysis: A Computer Oriented Approach- Affi, A.A., Academic Press, New York 1979.

Reference Book:

1. Introduction to Mathematical Statistics- Hogg, R.V. et al, American Publishing, New York 1980.

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - IVth Semester MCA Code : CA40413(CA)

PRINCIPLES OF COMPILER DESIGN

UNIT – 1 : Introduction: Introduction to Compiler, Single and Multi Pass Compilers, Translators, Phases of Compilers, Compiler writing tools, Bootstrapping, Back patching. Finite Automata and Lexical Analysis: Role of Lexical Analyzer, Specification of tokens, Recognition of tokens, Regular expression, Finite automata from regular expression to finite automata, transition diagrams, Implementation of lexical analyzer, Tool for lexical analyzer – LEX, Error reporting.

UNIT – 2 : Syntax Analysis and Parsing Techniques: Context free grammars, Bottom-up-parsing and top down parsing, Top down parsing: elimination of left recursion, recursive descent parsing, Predictive parsing; Bottom Up Parsing: Operator precedence parsing, LR parsers, Construction of SLR, canonical LR and LALR parsing tables, Construction of SLR parse tables for ambiguous grammar, the parser generator – YACC, error recovery in top down and bottom up parsing.

UNIT – 3 : Syntax Directed Translation & Intermediate code generation: Synthesized and inherited attributes, dependency graph, Construction of syntax trees, bottom up and top down evaluation of attributes, S-attributed and L-attributed definitions. Postfix notation; Three address code, quadruples, triples and indirect triples, Translation of assignment statements, control flow, Boolean expressions and Procedure Calls.

UNIT – 4 : Runtime Environment: Storage organization, activation tree, activation record, allocation strategies, Parameter passing, symbol table, dynamic storage allocation.

UNIT – 5 : Code Optimization & Code Generation: Basic blocks and flow graphs, Optimization of basic blocks, Loop optimization, Global data flow analysis, Loop invariant computations. Issues in the design of Code generator, register allocation, the target machine and a simple code generator.

Text Books :-

1. Compiler-Principles, Techniques and Tools by Alfred V.Aho, Ravi Sethi and J. D. Ullman, Addison Wesley.
2. Principles of Compiler Design, Alfred V.Aho and J.D.Ullman, Narosa Publication.

References :

1. Compiler Design in C by A.C. Holub, Prentice Hall of India.
2. Compiler Construction (Theory and Practice) by A.Barret William and R.M.Bates (Galgotia Publication)
3. Compiler Design, Kakde, Compiler Design, Galgotia Publication.

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - IVth Semester MCA Code : CA40414(CA)

SOFTWARE ENGINEERING

UNIT – 1 : Introduction: The software and software engineering problem, approach and goals of software engineering. **Software Processes and Models:** Processes, projects and products, component software processes, characteristics of a software process, software development process, project management process, software configuration management process. Models: Linear sequential, prototyping, RAD, incremental, spiral, WINWIN spiral, concurrent development model.

UNIT – 2 : Software requirement Analysis and Specification: Software requirement, need for SRS, characteristics and component of SRS, specification languages. Requirement analysis, formal & informal approach, structured analysis, object oriented modeling, Structure of a requirement document, validation of SRS, requirement reviews, size measures, quality metrics.

UNIT – 3 : Manning a software project: Cost estimation, uncertainties in cost estimation, building cost estimation, Size estimation: COCOMO model. Project scheduling, average duration estimation, project handling and milestones, staffing and personnel planning, Rayleigh curve, team structure, software configuration management plans, quality assurance plans, verification and validation, resources monitoring plans, risk management. **Function oriented design:** Design principles, coupling, cohesion, design notation and specification, structured design technology, verification, network metrics, stability metrics, information flow metrics.

UNIT – 4 : Software Testing Techniques and Strategies: Software testing objectives & principles, test case design, white box testing, black box testing.: A Strategic Approach to software testing, strategic issues, unit integration testing validation testing system testing, the art of debugging.

UNIT – 5 : Software Re-engineering: Software reengineering, software maintenance, a software reengineering process model, reverse engineering, restructuring code, data restructuring, forward engineering, the economics o reengineering.

Computer Aided Software Engineering: What is CASE, building blocks for CASE, taxonomy of CASE tools, integrated CASE environment, the integration architecture, the case repository. **Component Based Software Engineering:** CBSE process, domain engineering, Component based development, economics of CBSE.

Text Books :-

1. Pressman Roger, Software Engineering: A Practitioner's Approach TMH, Delhi.
2. Jalote Pankaj: An Integrated Approach to software Engineering, Narosa, Delhi.

References :

1. R.E.Fairly, Software Engineering Concepts, Mc Graw Hill, Inc 1985.
2. Poyce, Software Project Management, Addison Wesley.

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - IVth Semester MCA Code : CA40415(CA)

COMPUTER GRAPHICS & MULTIMEDIA

UNIT – 1 : Computer Graphics and output primitives: Concepts and applications, Random and Raster scan devices, Refresh Cathode ray tubes, LCD monitors, Laser, Printers, Keyboards, Mouse, Scanners, Graphics Software output primitives: Line drawing algorithm : DDA along with Bresenhan's. Circle generating algorithm, Midpoint algorithms: ellipse and other curves. Attributes of output primitive, Antialiasing, Area filling: Filled area primitive: Scan-line Polygon fill Algorithm, boundary fill algorithm, flood fill algorithm.

UNIT – 2 : 2-D-Transformation, Viewing, Clipping: Two-dimensional Transformations: Translation, scaling, rotation, reflection, shear, matrix representation of all homogeneous coordinates, composite transformation. 2D-projections– parallel and perspective projection. Two dimensional viewing, Viewing pipeline Window-to-view port transformation. Clipping operations. Line Clipping: Cohen Sutherland, Nicholl-lee-Nichol land Liang-barsky, Polygon Clipping.

UNIT – 3 : 3-D Transformation and Visible surface detection : Three dimensional object representations: Polygon Surface, Tables, Plane Equation. Curved lines and Surfaces: Spline representation, Interpolating and approximation curves, continuity conditions Cubic Splines, Bezier curves B-Spline curves: characteristics and generation, 3-D Transformation.

Visible Surface detection Algorithm: Object based and image based methods, depth comparison, A-Buffer, Back face removal, Scan-line method, Depth Sorting Method Area subdivision method.

UNIT – 4 : Overview of multimedia, Classification, basic concept of sound/audio MIDI: devices, messages, software. Speech, Video and Animation: Basic concept, computer-based animation, methods of controlling animation, display of animation, and transmission of animation.

UNIT – 5 : Data Compression: storage space, coding requirements. Source, entropy and hybrid coding some basic compression technique: runlength code, Huffman code. JPEG: Image preparation, Lossy sequential DCT – based mode, expanded lossy DCT based mode, Lossless mode, Hierarchical mode. MPEG, Huffman Encoding, LZW compression.

Text Books :-

1. Computer Graphics by Donand Hearn & M. Pauline Baker PHI.
2. Multimedia Computing Communication & Applications “ By Ralf Steimmety & Kerla Neshtudt.” Prince Hall.

References :

1. Principles of Interactive Compo Graphics; W.M.Newman & Robert F Sproull.
2. Computer Graphics by Rogers TMH.
3. Introduction to Computer Graphics Anirban Mukhopadhyay & Arup Chattopadhyay.
4. Schaum's outlines – Computer Graphics Mc Graw Hill International Edition.5
5. Principles of Multimedia by Ranjan Parekh TMH.
6. “Multimedia Systems Design”, P.K.Andleigh & K. Thakrar, Prentice Hall Pvt. Ltd.

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - IVth Semester MCA Code : CA40421(CA)

ARTIFICIAL INTELLIGENCE LAB

- (i) Write a prolog program to find the rules for parent, child, male, female, son, daughter, brother, sister, uncle, aunt, ancestor given the facts about father and wife only.
- (ii) Write a program to find the length of a given list
- (iii) Write a program to find the last element of a given list
- (iv) Write a program to delete the first occurrence and also all occurrences of a particular element in a given list.
- (v) Write a program to find union and intersection of two given sets represented as lists.
- (vi) Write a program to read a list at a time and write a list at a time using the well defined read & write functions.
- (vii) Write a program given the knowledge base,
If x is on the top of y, y supports x.
If x is above y and they are touching each other, x is on top of y.
A cup is above a book. The cup is touching that book. Convert the following into wff's, clausal form; Is it possible to deduce that 'The book supports the cup'.
- (viii) Write a program given the knowledge base,
If Town x is connected to Town y by highway z and bikes are allowed on z, you can get to y from x by bike.
If Town x is connected to y by z then y is also connected to x by z.
If you can get to town q from p and also to town r from town q, you can get to town r from town p.
Town A is connected to Town B by Road 1. Town B is connected to Town C by Road 2.
Town A is connected to Town C by Road 3. Town D is connected to Town E by Road 4.
Town D is connected to Town B by Road 5. Bikes are allowed on roads 3, 4, 5.
Bikes are only either allowed on Road 1 or on Road 2 every day. Convert the following into wff's, clausal form and deduce that 'One can get to town B from townD'.
- (ix) Solve the classical Water Jug problem of AI.
- (x) Solve the classical Monkey Banana problem of AI.
- (xi) Solve the classical Crypt arithmetic problems such as DONALD + GERALD = ROBERT of AI.
- (xii) Solve the classical Missionary Cannibals problem of AI.
- (xiii) Solve the classical Travelling Salesman Problem of AI.
- (xiv) Solve the classical Blocks World Problem of AI.
- (xv) Write a program to search any goal given an input graph using AO* algorithm.

List of Equipments/Machine required :

- (i) PC with Windows XP
- (ii) Visual Prolog Compiler

Recommended Books :

- (i) Ivan Bratko : Logic & prolog programming.

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - IVth Semester MCA Code : CA40422(CA)

COMPUTER GRAPHICS LAB

Experiments to be performed:

- (i) Write a program to draw a Line Using DDA algorithm.
- (ii) Write a program to draw a Line Using Bresenham's algorithm.
- (iii) Write a program to draw polygon (Triangle, square, pentagon etc).
- (iv) Write a program to draw Circle/Ellips using Mid Point Circle algorithm.
- (v) Write a program to implement Area filling using Scan Line Method.
- (vi) Write a program to implement Boundary fill 4-connected / 8-connected Algorithm using Recursion/Non Recursion.
- (vii) Write a program to implement Flood fill Algorithm using Recursion/ Non Recursion. OR Write a program to Fill a solid colored area./ Write a program to Fill a Multicolor Boundary area.
- (viii) Write a program to Translate a Line/Polygon.
- (ix) Write a program to Rotate and Scaling of a Line/Polygon With respect to
 - i) Origin
 - ii) Pivot Rotation
- (x) Write a program to perform Shearing of Polygon with respect to
 - i) X-axes
 - ii) Y-axes
- (xi) Write a program to perform reflection of polygon with respect to
 - i) X-axes
 - ii) Y-axes
 - iii) With respect to origin
 - iv) With respect to line $Y=X$
 - v) With respect to line $Y=mX+C$
- (xii) Draw Bazier curve using Local Control Point (60,20),(80,100),(150,90),(180,50).
- (xiii) Write a program to perform Clipping of Line using Cohen Sutherland Algorithm.
- (xiv) Prepare a game using graphics basic object and various transformations.

OR

Create a Paint Brush Like Application that include facility to draw all the basic object.

OR

Develop any useful tool (like watch) using graphics basic object and various transformations.

- (xv) Implementation of text compression using dynamic Huffman coding/ static Huffman coding

List of Equipments/Machine required:

- (i) PC with Windows XP
- (ii) Turbo C/C++ compiler

Recommended Books:

- (i) *Graphics and programming in C Rogers T , Stevens BPB*
- (ii) *Graphics under C by Yashwant Karnetkar BPB*

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - IVth Semester MCA Code : CA40423(CA)

PROJECT LAB - I

1. Project should be made using front-end tools with database.
2. Database should be normalized up to 3 NF.
3. The concept of System Analysis and design should be implemented.
4. Project report should be submitted.

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR (C.G.)
Semester - IVth Semester MCA Code : HS40424(CA)

REPORT WRITING & SEMINAR

Unit -I

Introduction to Technical Writing: how differs from other types of written communication Purpose of technical writing, Correspondence: prewriting, writing and rewriting Objectives of Technical Writing. Audience Recognition: High-tech audience, Low tech audience, Lay audience, Multiple Audience.

Unit - II

Correspondence: Memos, Letters, E-mails, Its differentiation, types of letters, Document Design, its importance, Electronic Communication: Internet, Intranet, extranet, Writing effective e-mail.

Unit - III

Summary: Report Strategies, Effective style of technical report writing: Structures: content, introduction, conclusions, references, etc., Presentation, Writing first draft, revising first draft, diagrams, graphs, tables etc. report lay-out.

Unit -IV

Report Writing: Criteria for report writing, Types of Report: Trip report, Progress report, lab report, Feasibility report, project report, incident report, etc. Case Studies.

Unit -V

Proposals & Presentation: Title page, Cover letter, Table of Content, list of illustrations, summary, discussion, conclusion, references, glossary, appendix, Case Studies. Oral Presentation/ Seminar:

Text Books:

1. Sharon J. Gerson & Steven M. Gerson "Technical Writing - Process& Product", Pearson Education.

Reference Books:

1. Sunita Mishra, "Communication Skills for Engineers" Pearson Education
2. Davies J.W. "Communication for engineering students", Longman
3. Eisenberg, "Effective Technical Communication", Mc. Graw Hill.